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American Machinist

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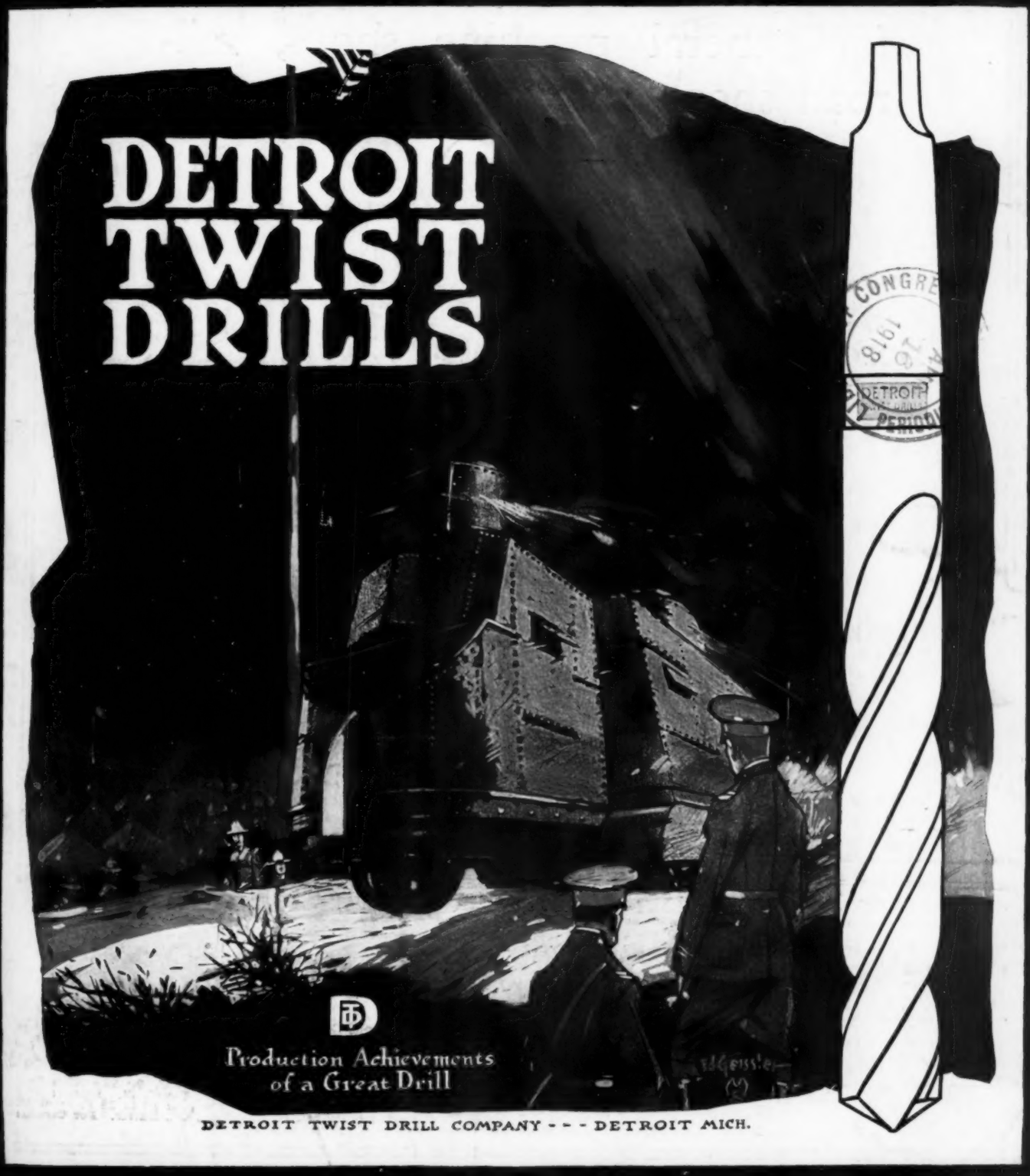

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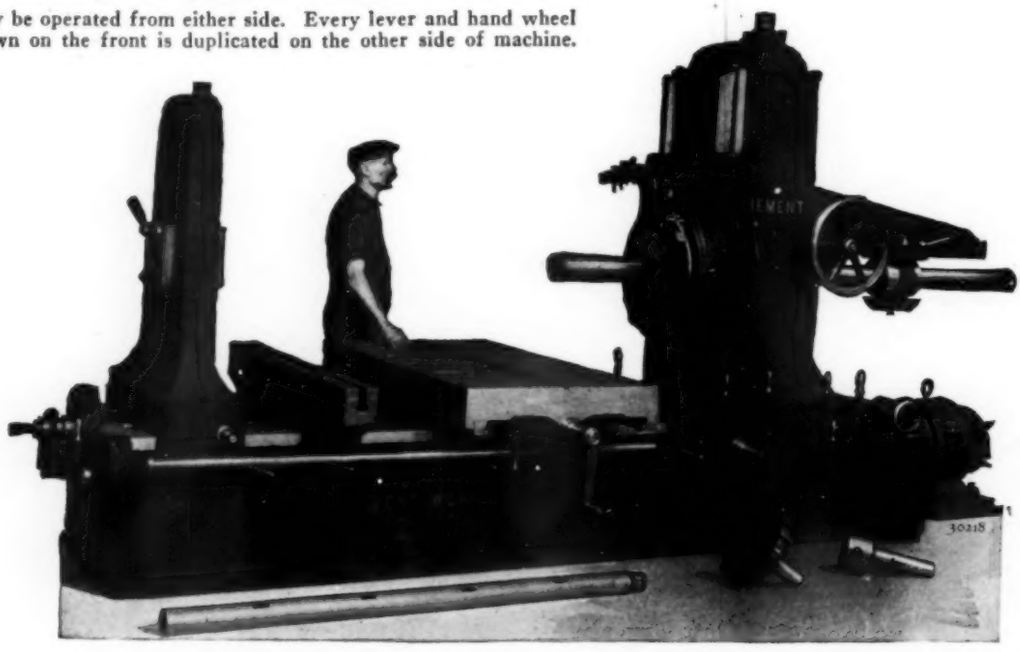

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American Machinist

FRED H. COLVIN, *Editor*

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WHO'S WHO

MR. A. D. ROBINSON

MR. A. D. ROBINSON was born in Worthington, Mass., September 9 1868, and at sixteen went to work as a clerk in a Pittsfield retail store. Eight years of bookkeeping followed, then he became office manager for the J. L. and T. D. Peck Mfg. Co., of Pittsfield.

Mr. Robinson left this position to become associated with the late Ralph D. Gillette in the organization and building of The Berkshire St. Ry. Co.

He has held the positions of Secretary and General Manager of this company, General Manager of the Western Mass. St. Ry. Co., General Manager of the Woronoco St. Ry. of Westfield, Mass., Secretary and General Manage of the Buffalo, Rochester & Eastern R.R. Co. and Treasurer and General Manager of the Western, Mass., Contracting Co.

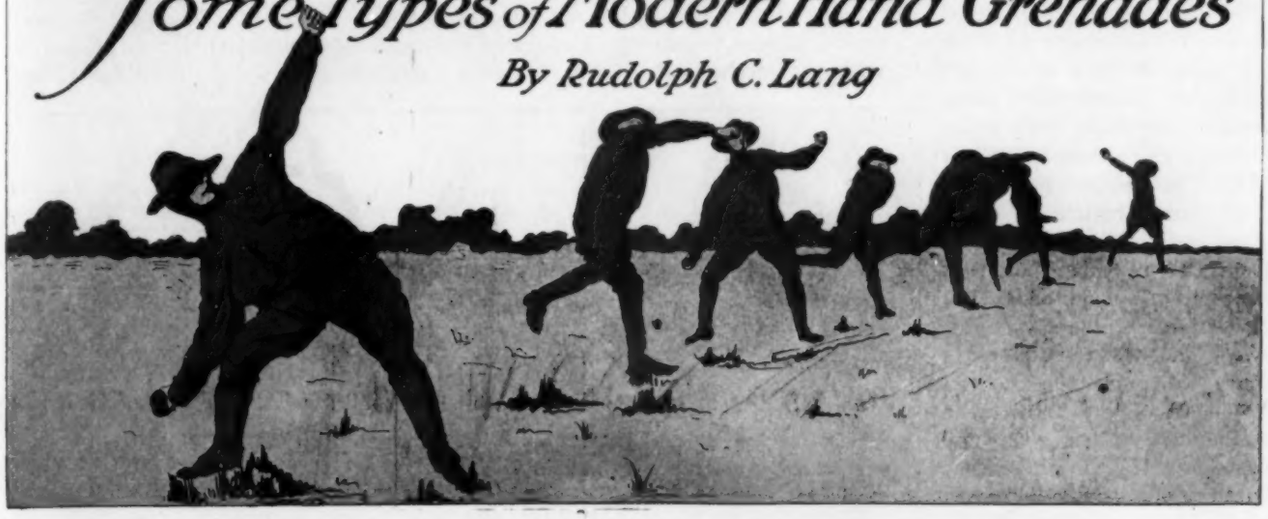
He is now Vice-President and General Manager of the Maxf Grinding Wheel Corporation, President and Treasurer of the Robinson Mfg. Co., Westfield, Mass., and Director of the Campagnie Generale des Meules, Paris, France.

He is a member of the Tekoa Country Club and the Westfield Club but his hobby is work.

Business genius is rare, but Mr. Robinson believes that an average supply of brains, industry and fair play will bring the same results—a belief he has vindicated.

Some Types of Modern Hand Grenades

By Rudolph C. Lang



In these times when practically the entire world is engrossed in the most gigantic struggle man has ever witnessed science has advanced in leaps and bounds. These various discoveries and inventions are often entirely new and have been brought about by some necessity or have in themselves some new or basic principle. These, however, are small in number compared to those which involve an improvement on some existing process or machine. It is in this latter class that we place the hand grenade.

THE word grenade comes from the French word for pomegranate, after which it was named owing to its resemblance to that fruit. Hand grenades are by no means a new weapon, as they have been used by their sponsors, the French, as far back as the year 1594. They were crude, uncertain and far from satisfactory, simplicity probably being their most valuable asset, but they accomplished to some extent favorable results, the only preventive taken against them being breastplates or shields, which were part of the accouterment of every warrior in those days. Special troops were trained in the art of throwing them, and thus we get the word grenadiers. A small hand gun called the musketoon was also sometimes used to project these bombs short distances.

The ancient grenades, or bombs, were usually of a spherical type, made of some cast metal or annealed glass with a short tubular section or neck protruding through which the explosive was placed and then the fuse. Aside from the fact that the cast-metal ones were heavy they were all dangerous to use, as their weight greatly affected the range, and their accidental dropping, owing to their being nearly spherical, plus the psychological nervousness of war, caused many to explode in proximity to their user, resulting in his death as well as that of his comrades.

Another element of danger manifested itself in one of the types (Fig. 1) used at the beginning of the present war, when it was found that when a long fuse was used the enemy was able to throw the grenade back before it exploded, thus effecting explosion and fragmentation in the trench of the original sender. To overcome this a shorter fuse was adopted, but which went to the other extreme by causing premature detonation, the sender frequently being unable to send the bomb off quickly enough after lighting. As matches, cigars, cigarettes, etc., were usually used for ignition, the disadvantage of this method of lighting the fuse, especially in inclement weather or strong winds, can readily be observed. But even if all the faults mentioned were overcome there was nothing to prevent the grenade falling on soft land or in the water, thus snuffing out the fuse. All these things went against the continuance of this type of ordnance and it was abandoned. Today the nations at war are perfecting the machine gun, heavy-caliber artillery and other contrivances designed to emit greater death-dealing missiles of wider range, with the object of attacking the enemy at a greater distance, thus affording more security in repelling attacks or making advances.

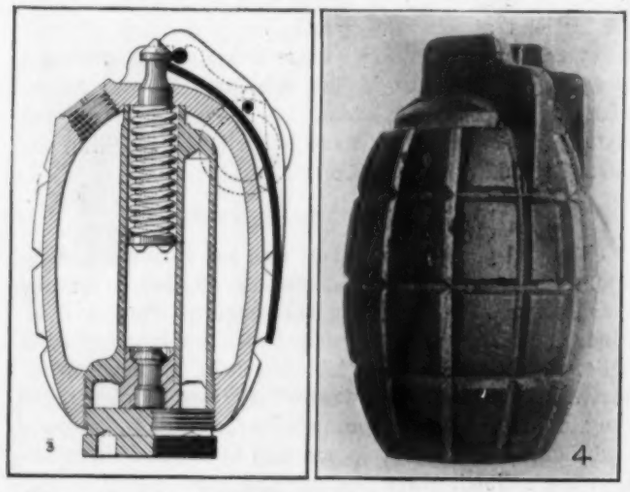
Revival of the Grenade

The hand grenade, however, was not to remain obsolete, and in 1904 after a dormancy of over a century its use was revived during the siege of Port Arthur. Since then it has been developed into a weapon of most delicate mechanism, the last word in modern manufacturing. While long strides have been taken much remains to make the grenade safer for its thrower and more deadly to its object, and to attain this condition the following are perhaps the most essential factors: Proper weight, so as not to strain the thrower's arm; proper shape, so as to fit the hand, thus preventing accidental dropping; if detonated on time the attachment of an accurate timing device; if detonated on impact the attachment of a delicately balanced apparatus actuated by striking water, soft earth, snow or marshes; imperviousness to moisture; it must operate in extreme temperatures; it must not explode on accidental dropping at less than 5 ft.; it must show per-

fect fragmentation of slugs; it must have strong penetrative possibilities, and must be easily charged and be safe when in this condition if subject to severe jolting from transportation.

To the foregoing requirements it should also be inexpensive to manufacture. However, most grenades in use are composed of a cast-iron shell with the mechanical parts of die-casting metal which make them quite satisfactory and inexpensive as well. The cast-iron bodies are molded on a match plate, the usual practice being to make from two to three dozen at one time in a mold, depending on their size, shape, weight, etc. The die-casting parts cause little trouble, modern methods enabling them to be produced practically in any shape or size, including screw threads, internal and external, of the highest accuracy and keeping within plus or minus 0.001 in. where necessary. Numerous formulas have been concocted for this zinc base alloy of which these die castings are made, which have some characteristic specially adapted to some kind of work, the following being one that is used very satisfactorily by a large die-casting concern for turning out grenade parts: 88 per cent. zinc, 8 per cent. tin and 4 per cent. copper.

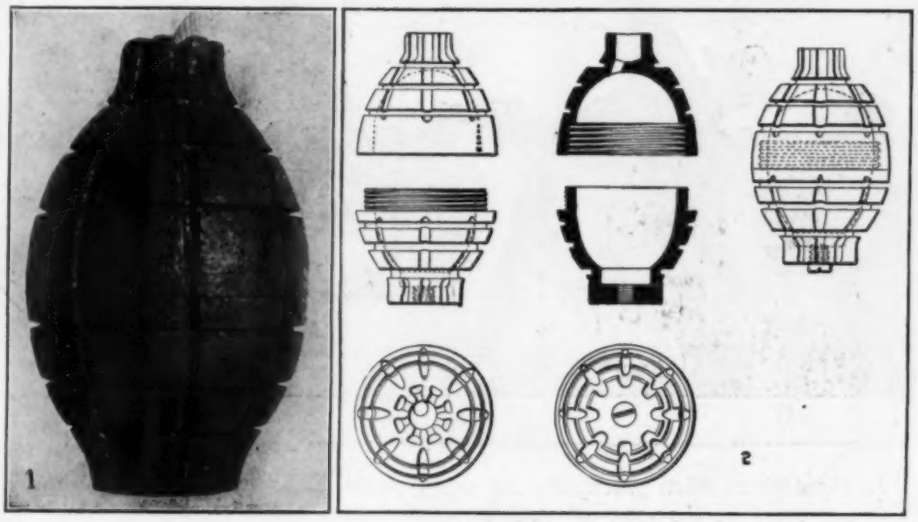
A few parts, such as striker pins and springs, must be made of steel, and as many grenades contain a cocked spring the question arises, Can a spring be compressed for an indefinite period and still retain its life? To which it may be answered that any well designed and tempered spring should withstand pressure for at least ten years without showing any appreciative deficiency.



FIGS. 3 AND 4. CROSS-SECTION AND CASTING OF THE ENGLISH MILLS GRENADE

There are scores of designs of hand grenades, about three hundred having gone through the Patent Office. In these have been used almost every conceivable means for detonation. Some release the striking part by dislodging a weight actuated on impact with some object; others with a timing device set for a predetermined period (usually 5 sec.) while still others use the twirling action of a baseball to release some component part. One type used the match-tip idea and advocated that the soldier should have a piece of sandpaper fastened to his sleeve for lighting a match prior to throwing.

Fig. 1 shows a grenade used by the Russians a year or two ago. Fig. 2 shows a cross-section of the same type. They are crude affairs having little advantage over their primitive brothers of ancient history, the only modern feature being the annular and lateral grooves running about the surface of the bomb. These grooves, which appear on many others of recent design, have two accomplishments, one being to decrease the necessary charge, the other to prevent either pulverizing in an attempt to produce good fracture or breaking it in few pieces with little penetration. These grenades were made in two sections of cast iron screwed together after being charged. A small hole at one end, through which the fuse is placed, completes it. They were sold in large quantities of one, two or five million at about 27c. apiece, this price excluding explosive charge of 4 oz. of ammonal. It was no wonder that these were soon discarded, as the casualty lists of its users were nearly on par with the enemies.



FIGS. 1 AND 2. RUSSIAN HAND GRENADE

Fig. 3 shows a cross-section and Fig. 4 a shell casting of what is known as the No. 5 I.L., or Mills, pattern. This type is used extensively by the British. It is operated by a timing device set for 5 sec. When ready for use it is placed in the palm of the hand so as to hold the lever securely at the side. Then by extracting the cotter pin and ring which held it in place during shipment it is thrown. The lever then automatically ejects itself, thereby releasing the striking pin. Care must be taken not to liberate this lever until it automatically does so itself after being thrown. The striker pin thus released forcibly connects by a cocked spring to a 0.22-rim fire cap from which the wad and powder are omitted and which merely retains the fulminate of mercury in the rim. In place of the wad and powder a fuse cut just long enough to consume 5 sec. is crimped in and connected to a No. 6 Nobel detonator placed in a very thin casing of die-casting metal alongside of the tube containing the striker pin, spring,

etc., this being as near central to the interior of the shell as is possible with this particular construction. It should also be noted that the anvil or part which supports the cap has an internal V-shaped annular groove from which are led two small drill holes, or vents, while the cap is also perforated on one side. The object of this is to forestall any possibilities of blowing out the fuse instead of igniting it, which would frequently happen from the gases and smoke formed on the inside between the cap and fuse when firing the fulminate of mercury in the cap.

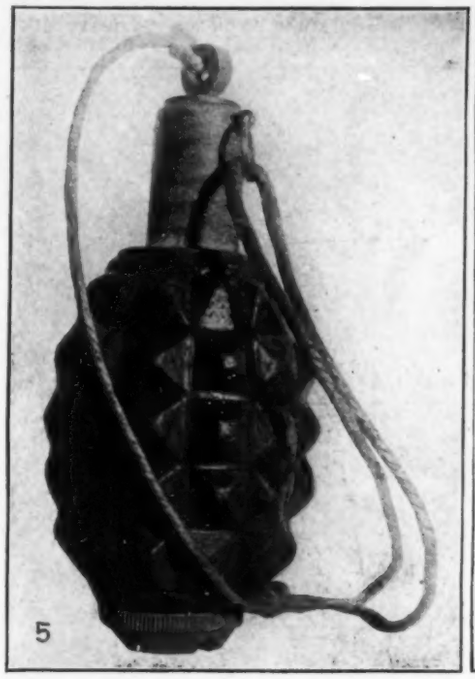


FIG. 5. CORD-OPERATED TYPE

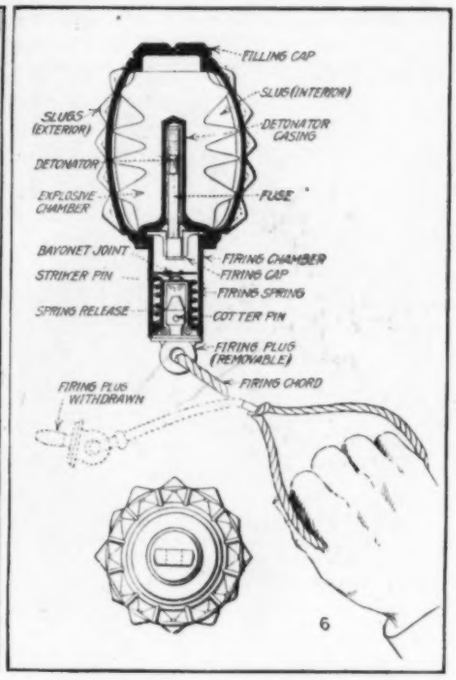
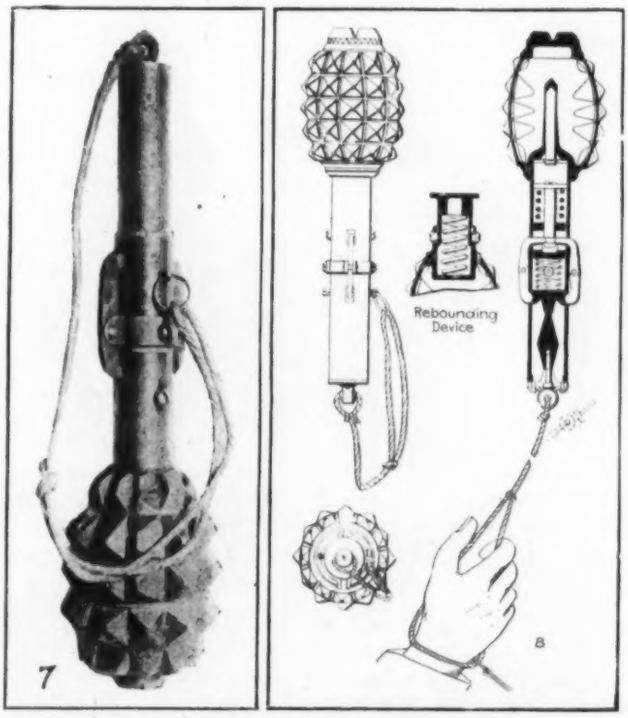


FIG. 6. DETAILS OF CORD TYPE

Summing up in a general way the series of functions, we have the following: The grenade is thrown, lever *A* automatically ejected, striker pin released and fires the cap, thus igniting the fuse. The fuse then burns 5 sec. and ignites the detonator, which sends off the necessary detonating wave to explode the 2¼ oz. of powdered ammonal, the charge specified by the British government. It then fragmentizes in about sixty pieces, scattering in all directions, any one of the slugs being fatal if striking a vital spot within a 100-ft. radius. Beside various explicit rules for shipping and inspecting, the grenades must be lacquered on the outside with a solution of gum shellac (2 lb. 2 oz.) and methylated spirit (1 gal.) to prevent rust. This type, though considerably more efficient than those already described, still leaves ample room for improvement in the direction of safety.

Fig. 5 shows another style of grenade having an ingenious method of firing designed to safeguard the user. It is shown in cross-section in Fig. 6, and is operated by a cord attachment which is retained when throwing the bomb, thereby releasing a striker pin under the pressure of a spring and effecting detonation in the regular way with cap, fuse detonator, etc. The unique part of this contrivance is that it requires just enough momentum to overcome a slight resistance when extracting the plug to insure its leaving and traveling a safe distance away. Should the thrower be shot or accidentally stumble the grenade drops the length of the cord, but remains there hanging on his wrist without exploding, as the force of the grenade dropping the length of the cord is not sufficient to release it. This construction has met with a few more ideal conditions not exemplified in the preceding types shown or described. One of these is the exact central location of the detonator, giving equal detonation all around, and the other is in keeping the mechanism simple, light and out of the shell, thereby using all the cubical contents for explosion necessary and when utilizing its entire forces for the fragmentizing of slugs. The weight of these grenades is about 1 lb. each, when they are complete and ready for use, which is about the weight an ordinary man can throw 35 yd. After a little practice improvement as to distance and aim is thus developed, some being able to hurl them 50 yd. It is said that Americans are most adept in this art, probably owing to the fact that their national game is baseball. An article on hand grenades would be incomplete without describing a certain style, which is operated on impact and which is perhaps the most important because it is the only practical type for airplane use.



FIGS. 7 AND 8. A GRENADE OF THE IMPACT TYPE

The great differences in altitudes from which it is used necessitates anywhere from 5 to 20 sec. to drop, making this bomb or hand grenade (Fig. 7) suitable for either hand or aerial purposes. It is also shown in cross-section in Fig. 8. For air work, where weight is not such an important factor as when thrown by hand, larger shells with heavier charges are used. This type, as in Fig. 5, is also operated by extracting a cord which in the grenade does not effect detonation as before, but removes a pin, thereby allowing a double conical weight to be delicately held at its ends. This extraction is done when thrown, and it is plainly seen that the slightest jolt in this position will shift either the upper or lower end and allow the spacer to move upward. The two trigger fingers held apart by this spacer come together. Being fulcrumed at the center the lower prongs of these fingers recede and release the striker pin thus held in place under compression of a spring. The rest of the parts function in the regular way as described, the only slight change being in the fuse, which is now made as short as possible, merely being used as a means for connecting the cap and detonator.

FIG. 9. A CONDEMNED TYPE OF GRENADE

FIG. 10. BELGIAN GRENADE

Two other types of grenades are shown in Figs. 9 and 10. While there are many other types and styles on the market, each one embodying some individual characteristic, the foregoing will tend to give an idea of the advantages and disadvantages of this weapon brought out again because of trench warfare.

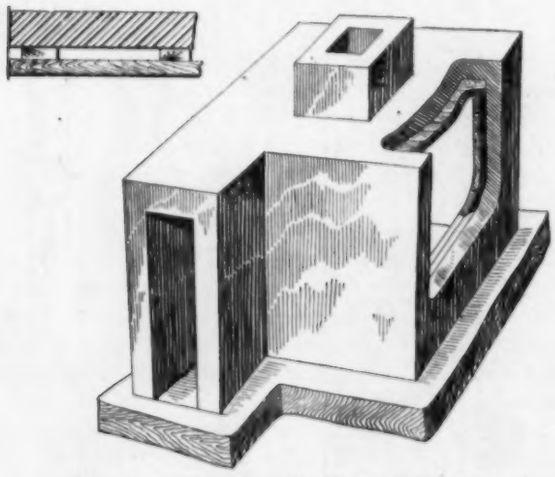


FIG. 11. GRENADE-TESTING CHAMBER

Never before has so much time and energy been expended in excavating trenches and making them habitable. Extending mile after mile they are deep, strong and purposely irregular with sometimes not more than 30 or 40 yd. intervening between opposing trenches. Artillery at this range would be ridiculous, machine guns and rifles often little better, as the great velocity would send their missiles singing over the top. So hand grenades became an invaluable part in the struggle. No velocity was required by them to produce penetration, and it was not a very difficult matter to heave them in high trajectories so that their detonation would take place either on landing or over the opposing trenches, depending on the type used. They were also found to be helpful when charging trenches, especially those which were being vacated or seemingly so, as it often occurred that in charging a trench or fortification of some kind, thinking that the artillery and rifle fire had thoroughly cleaned it out, there would still be a few left who were unable to make the retreat or were stubbornly courageous and who could only be captured or killed after a sacrifice of one or more lives. A few grenades thrown in these trenches or dugouts prior to entering served to either kill anyone lurking in its dark corners or wound them beyond any possibilities of retaliation. So the grenade has come to stay, at least until some very radical change is made in the methods resorted to by warring people.

Several explosives, such as trinitrotoluol (TNT), tetranitroaniline (TNA), cordite, ammonal, lyddite, etc., have been used in these small but convincing bits of ordnance, of which perhaps TNT is the best. It has great fracturing power, is very penetrative, takes up little room, is safe to handle and is put up in either crystal or gelatine form. The usual charge is from 1 to 2 oz. While experimenting on the last two types it was found that the best results were got by using 1¼ oz. of TNT detonated by a detonator of tetryl.

An exhaustive test of these grenades must be made before adopting any specific type, and even after one has been passed on it is tried from time to time to insure a uniform product. The usual procedure in testing these grenades is first for penetration; secondly, for distribution of fragments, and last, if both the former warrant further investigation, the jolt test.

Fig. 11 shows one of the chambers used at the Bethlehem Steel Corporation for testing grenades. It is a steel chamber approximately 10 ft. square, 15 ft. high with wall 12 in. thick and a square opening on top used as a vent for the gases that have been developed. A narrow door opening from a short passageway leading from the chamber completes the entire structure, which is anchored on a heavy reinforced-concrete foundation; covering the entire interior is a layer of heavy coarse wood over which are placed large sheets of paper. These sheets are renewed after each test, as the following will explain. The reason for all these is to ascertain the true fraction, both as to the number of pieces or slugs as well as their scattering effect. The penetration is then clearly seen in the wooden lining, which also prevents the pieces, or slugs, from rebounding through the paper on which the scattering effect is clearly shown. When the grenades have thus far proved satisfactory they are submitted to a jolt test, which is nothing more than putting a few of them in a box to which is fastened at one end a long pole. The examiner then places himself behind a barricade and grasps the other end of the pole which passes through a small aperture of the barricade. He then shakes the box vigorously, subjecting the grenades to a severe jolting not only against the wood but also against one another. When he has shaken them in this manner about a dozen times they are then passed as safe for delivery.

Repairing an Engine Without Tools

By M. L. Lowrey

A short time ago I was sent to install a new saw arbor in a small mill located in the Sierra Nevada Mountains. The mill was driven by an old side-valve steam engine that was hardly large enough to do the work required of it, and after my job was done and while waiting for the stage that was to take me back to civilization the old engine suddenly stopped.

The engineer was not a machinist, knowing only enough to fire the boiler and oil the engine. The nearest machine shop was 30 miles away, and as the mill was far behind with its orders the owner begged me to stay and try to get the engine running again.

Upon examination it was found that the eccentric which operated the slide valve had slipped. It had been secured with only one setscrew, and this screw had stripped the thread in the eccentric. At first glance it seemed to be impossible to do anything without tools; however, as the owner was really up against it I determined to make an effort, if only to show my goodwill.

They had a small forge and a few poor tools, among which was an old-fashioned "King" blacksmith's adjustable die stock that could be adjusted to cut almost any size; but the dies were so nearly worn out that it was impossible to cut anything like a decent thread with them. I found a piece of tool steel and forged a tap blank, then ran the old dull die over it a few times to mark the thread which I proceeded to cut with a triangular file, running the die on from time to time to keep the tap round and the pitch true. In this way a very good thread was cut—almost entirely with the file. The tap was then fluted with a flat file and tempered.

It would have been a long job to take the eccentric off the shaft, so after removing the strap the hole in the eccentric was tapped until the point of the tap reached the shaft. The tap was then water annealed and its point sawed off to make it a bottoming tap, after which it was retempered and the hole tapped to the bottom. I then forged a tool-steel setscrew, making the cup point with a round-nose set, and threaded it with the die and file in the same manner as the tap was made, tempered its point and screwed it in place.

The eccentric, which had not been in the right place, even before the accident, was reset; the setscrew was tightened up and driven into the shaft by placing a set on its head and striking the set with a heavy hand hammer, following up with a wrench. The engine was then started and everything was O.K.

The setscrew was about $\frac{13}{16}$ in. diameter and $1\frac{1}{4}$ in. long. My time on the job was six hours. The owner of the mill was pleased to get running again so quickly and said "Thank you," at which I was very much disappointed, as I knew I had saved him quite a great amount of time and the expense of having a machinist come to the mill.

I misjudged the man, however, for when he paid his bill on the first of the month he sent a very complimentary letter stating that he appreciated my efforts, and paying for one day extra for my time, also saying that the engine developed considerably more power than it did before I set the valve. Best of all he inclosed a check for me as a bonus.

The Modern Foreman—What Is His Present Job?

By A. G. Stoehr

After carefully analyzing the article on page 1089, Vol. 48, of the *American Machinist*, under the title of "The Modern Foreman—What Is His Present Job?" I wish to say that Mr. Ellsworth seems to be presuming when he deprecates the "departments," meaning the engineering, efficiency and planning departments, which are represented by some of our very best men both theoretically and practically. I also might suggest that we are hardly running factories at the present time as they were run 40 years ago, and that if we were we could not reach Berlin, as he puts it, in a century.

There is no question in the mind of any factory man of even limited experience that the present-day method of engineering is at least 100 per cent. more efficient than the method of 40, or even 20, years ago. This is so not because the old-time foreman was not a good mechanic or an efficient foreman, but because when a factory organization is divided into several departments, each under a man of broad education and practical experience, and each department having its specific duties to perform, it is far more flexible and efficient than when one man of say equal caliber tries to be all of the departments and foreman at the same time.

Running a factory organization with one old-time foreman would be like running an automobile with one wheel. It can readily be seen that one wheel would perform the functions of any one of the others if properly placed, but it is evident that it would hardly be a safe car to ride in.

The Noise That Counts

By Rufus T. Strohm

Uncle Sam is kinder weary of the guys that rant an' brag
To the screamin' of the eagle an' the wavin' of the flag;
Though he's mighty easy-goin', it has filtered through his head
That if talk could do the bizness, Kaiser William would be dead;
So he has his optics open, an' his mouth is tightly shet,
For he understands the rumpus that he's joinin', you can bet,
An' a feller that's a crossbreed of a beaver an' a clam
Is the sort that warms the cockles of the heart of Uncle Sam.

If you hanker to be helpin' in this nasty little scrap
That will last until we've walloped every German on the map,
An' your patriotic feelin's make you lay awake at night
Plannin' how to call attention to the fact you'd like to fight,
Quit your wishin' for the limelight an' the rollin' of the drums,
An' freeze fast with both your mittens to the first old job that comes;
All the posin' an' the shoutin' isn't worth a tinker's damn,
For it's doin' something useful that appeals to Uncle Sam.

If you've got to make a racket so that folks will understand
That a patriot is workin' for the glory of his land,
Get a job of drivin' rivets in the buildin' of the ships,
Grab an ax an' hunt the timber an' begin to scatter chips;
Tend the hammer that is forgin' of the rifle or the gun
That will perforate the soup plate an' the bean of any Hun,
Or perhaps will make a colander of Fritz's diaphragm—
That's the cheerful kind of clatter that will tickle Uncle Sam.

From the chuggin' of the engines hoistin' coal from out the pit
To the rumblin', roarin' breaker with its clouds of dust an' grit,
Or the quiet sort of scratchin' of a pencil or a pen
As it writes the stirrin' message that will thrill a million men,
Or the clickin' of the binder in the fields of golden wheat
As it garners in the harvest for a hungry world to eat,
Or the snippin' of the clippers as they shear the woolly lamb—
Say, them sounds is just like music to the ears of Uncle Sam.

Working Out a Theory in Shop Management

EDITORIAL CORRESPONDENCE

The changing attitude of shop managers and owners is shown in the view of an executive as expressed in the first part of this article. The practical application of these ideas shows very clearly in the part which deals with the White Motor Co. This is particularly interesting on account of its utilization of men of over 40 years of age and the way in which the shop is run by commission, giving the men a direct voice in the management.

NEVER in the history of this country or the world has it been more necessary to study carefully the problem of securing and retaining efficient labor in the shops. While there is little real shortage of labor at the present time, except in skilled men, there is likely to be a scarcity, as is very often the case, when we really get down to making munition work of all kinds. The immediate problem, therefore, is to prevent the undue shifting of operatives from plant to plant and from city to city.

The majority of the opinions here expressed are those of a careful observer of human nature, a successful manager of a large shop, whose judgment is based on actual manufacturing conditions. Only modesty on his part prevents me from quoting him by name and crediting him with the first part of this article, as I should like to do. The second part comes from a source from which I am permitted to quote only the firm, but not the individuals who have helped to build the system to its present successful stage.

Labor Turnover Keeps Down Both Payroll and Production

He views the question of labor turnover from two angles—that of securing such productive efficiency as will enable a larger return to be given to the worker, and the keeping down of the payroll to please directors who believe this is the only way to secure the largest returns for themselves. Regarding the second point, he makes it clear that whittling down wages does not secure the largest product from the equipment because there is no incentive to further efforts. In fact, wherever piece rates are cut when wage earnings exceed a given amount there is a distinct effort to keep down the output.

In the same way a large labor turnover enables a goodly proportion of those on the payroll to remain at the minimum wage, and this is probably one of the reasons why excessive labor turnover has not been more strongly objected to in the past. With a small labor turnover we have a comparatively constant body of men, and in such cases it becomes necessary to increase the daily or hourly rates occasionally, if not regularly, which is not very pleasing to some types of shop managers.

If it means anything to a firm to be able to point with pride to men who have been with them for many years it means that the fact of their working in the shop so long a period is an asset to the company and consequently it has a cash value. For there are other factors besides actual output to add to a man's value. Dependability in emergencies; care of machines and of products; effect on the men, as well as other things which are difficult to measure in dollars and cents, all have real value to a concern and add to the cash balance at the end of the year.

On the other hand there are men in every concern who could well be spared, yet ties such as long service and others prohibit their dismissal unless it is desired to violate the rule of fair play and cause an actual loss owing to its impression on the other men. When an efficiency engineer undertakes to rejuvenate an old shop he generally begins by making a clean sweep, especially of the heads of departments. This course also has its disadvantages, as many a shop which has suffered from the effects of an incompetent systematizer has found out to its sorrow.

How the White Motor Company Does It

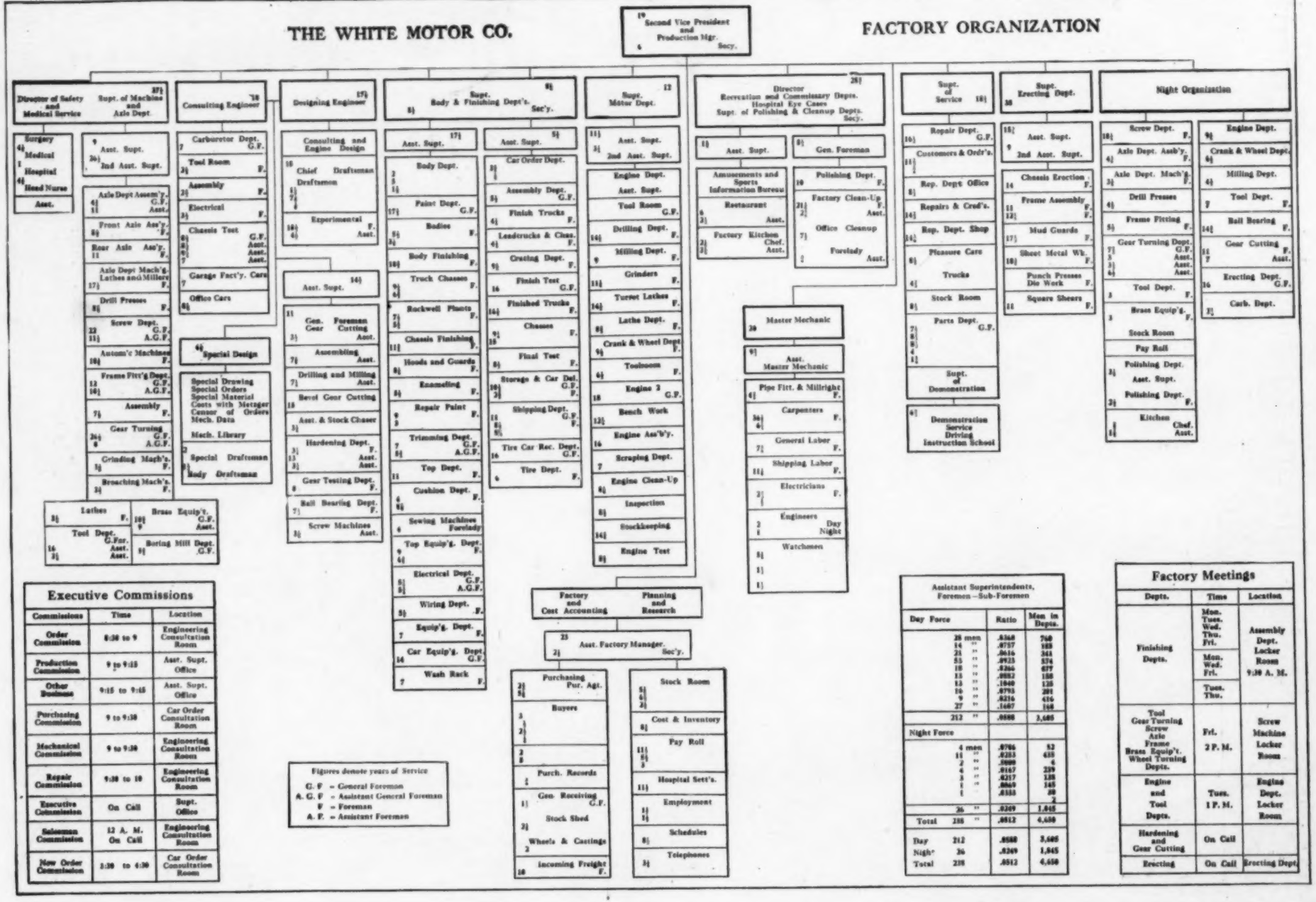
Coming now from the theories of this careful observer to a concrete example of what one large firm has been doing along similar lines, it is interesting to note that some very advanced ideas of equitable relationship toward the men are being carried out in a number of cases.

The work which the White Motor Co. of Cleveland has been doing for a number of years in this way is highly interesting and might almost be called revolutionary by the reactionary manager. Some time ago those in charge of the employment of men noticed that, in common with almost all large manufacturing concerns, the average age of their employees was very low—about 26 years, according to the statistics gathered. In some larger shops it is even lower, and this alone accounts in all probability for much of the labor turnover. The spirit of change and unrest is usually much stronger at this age than later, due in part to the desire for more experience, which is a very good trait, but does not assist large production while the changes are going on.

Beginning about three years ago the White Motor Co. decided to raise the average age of its employees, and, reversing the policy of Dr. Osler, which has done the machine-manufacturing industry so much harm and has worked such cruel hardships on many perfectly capable men of middle age, it now gives preference to men over 30 years of age. Needless to say the company does not chloroform him when he reaches the age of 40 years.

Continuing this feature the White company has gradually increased the average age of its employees to about 40 years, and at the same time the production per man has increased in a most interesting and hopeful manner. Part of this increase is due no doubt to the fact that the company has reduced its labor turnover very materially, the average being between three and four per cent. a month, and this in spite of many of its men having been called to the colors. Along with this the number of absentees from the shop during

THE WHITE MOTOR CO. — FACTORY ORGANIZATION


19 Second Vice President and Production Mgr. 4 Secy.
Director of Safety and Medical Service 37½
Surgery 4½
Medical 1
Hospital 4½
Head Nurse
Asst.
Supt. of Machine and Axle Dept. 37½
9 Asst. Supt.
26½ 2nd Asst. Supt.
Axle Dept Assem'y. 4½ C.F. 11 Asst.
Front Axle Ass'y. 8½ F.
Rear Axle Ass'y. 11 F.
Axle Dept Mach'g. Lathes and Millers 17½ F.
Drill Presses 8½ F.
Screw Dept. 23 G.F. 11½ A.G.F.
Autom'c Machines 10½ F.
Frame Fitt'g Dept. 13 G.F. 14½ A.G.F.
Assembly 7½ F.
Gear Turning 24½ G.F. 6 A.G.F.
Grinding Mach's. 1½ F.
Broaching Mach's. 3½ F.
Lathes 3½ F.
Tool Dept. G.For. 16 Asst. 3½ Asst.
Brass Equip't. 10½ G.F. 9 Asst.
Boring Mill Dept. 9½ G.F.
Consulting Engineer 18
Carburetor Dept. 7 G.F.
Tool Room 3½ F.
Assembly 3½ F.
Electrical 3½ F.
Chassis Test 6½ G.F. 8 Asst. 6½ Asst. 7 Asst.
Garage Fact'y. Cars 7
Office Cars 6½
Special Design 46
Special Drawing
Special Orders
Special Material Costs with Metzger
Censor of Orders
Mech. Data
Mech. Library
2 Special Draftsmen
9½ Body Draftsman
Designing Engineer 17½
Consulting and Engine Design 10
Chief Draftsman
Draftsmen 1½ 7½ 4
Experimental 18½ 4½ F. Asst.
Asst. Supt. 14½
11 Gen. Foreman Gear Cutting 3½ Asst.
Assembling 7½ Asst.
Drilling and Milling 7½ Asst.
Bevel Gear Cutting 18
Asst. & Stock Chaser 3½
Hardening Dept. 3½ F. 13 Asst. 8½ Asst.
Gear Testing Dept. 8 F.
Ball Bearing Dept. 7½ F.
Screw Machines 3½ Asst.
Supt. Body & Finishing Dept's. 8½ Sec'y.
Asst. Supt. 17½
Body Dept. 2 3 1½
Paint Dept. 17½ G.F.
Bodies 8½ 3½ F.
Body Finishing 10½ F.
Truck Chassis 9½ 6½ F.
Rockwell Plants 7½ 5½ F.
Chassis Finishing 11½ F.
Hoods and Guards 8½ F.
Enameling 8½ F.
Repair Paint 9 3 F.
Trimming Dept. 7 G.F. 8½ A.G.F.
Top Dept. 11 F.
Cushion Dept. 4 8½ F.
Sewing Machines Forelady 6
Top Equip'g. Dept. 9 4½ F.
Electrical Dept. 8½ G.F. 5½ A.G.F.
Wiring Dept. 5½ F.
Equip'g. Dept. 7 F.
Car Equip'g. Dept. 14 G.F.
Wash Rack 7 F.
Asst. Supt. 5½
Car Order Dept. 3½ 1
Assembly Dept. 5½ G.F.
Finish Trucks 4½ F.
Leadercks & Chas. 4½ F.
Crating Dept. 9½ F.
Finish Test 16 G.F.
Finished Trucks 14½ F.
Chassis 9½ 16 F.
Final Test 8½ F.
Storage & Car Del. 10½ G.F. 3½ F.
Shipping Dept. 11 G.F. 8½ F. 9½
Tire Car Rec. Dept. 16 G.F.
Tire Dept. 4 F.
Supt. Motor Dept. 12
11½ Asst. Supt. 3½ 2nd Asst. Supt.
Engine Dept. Asst. Supt.
Tool Room 14½ G.F.
Drilling Dept. 9 F.
Milling Dept. 11½ F.
Grinders 14½ F.
Turret Lathes 8½ F.
Lathe Dept. 9½ F.
Crank & Wheel Dept. 4½ F.
Toolroom 18 G.F.
Engine 2 12½ G.F.
Bench Work 16
Engine Ass'b'y. 7
Scraping Dept. 6½
Engine Clean-Up 8½
Inspection 14½
Stockkeeping 8½
Engine Test
Director Recreation and Commissary Depts. Hospital Eye Cases Supt. of Polishing & Cleanup Depts. Secy. 28½
1½ Asst. Supt.
Amusements and Sports Information Bureau
Restaurant 6 3½ Asst.
Factory Kitchen 2½ 3½ Chef. Asst.
8½ Gen. Foreman
Polishing Dept. 10 F. 21½ 2 F. Asst.
Office Cleanup 7½ Forelady 2 Asst.
Master Mechanic 20
9½ Asst. Master Mechanic
Pipe Fitt. & Millright 4½ F.
Carpenters 34½ 4½ F.
General Labor 7½ F.
Shipping Labor 11½ F.
Electricians 2½ 1 F.
Engineers 2 Day 1 Night
Watchmen 5½ 1½ 1½
Supt. of Service 18½
Repair Dept. 10½ G.F. 11½ 2
Customers & Ordr's. 8½
Rep. Dept. Office 14½
Repairs & Cred's. 14½
Rep. Dept. Shop 14½ F.
Pleasure Cars 6½ Trucks 4½
Stock Room 8½
Parts Dept. 7½ 8½ 8½ 4 1½ G.F.
Supt. of Demonstration
6½ Demonstration Service Driving Instruction School
Supt. Erecting Dept. 38
15½ Asst. Supt. 9 2nd Asst. Supt.
Chassis Erection 14 F.
Frame Assembly 11 F. 12½ F.
Mud Guards 17½ F.
Sheet Metal Wk. 18½ F.
Punch Presses Die Work F.
Square Shears 11 F.
Night Organization
Screw Dept. 18½ F.
Axle Dept. Assb'y. 4½ F.
Axle Dept. Mach'g. 3½ F.
Drill Presses 4½
Frame Fitting 5½ F.
Gear Turning Dept. 7½ G.F. 5 Asst. 3½ Asst. 4½ Asst.
Tool Dept. 3 F.
Brass Equip'g. 3 F. Stock Room
Pay Roll
Polishing Dept. 3½ Asst. Supt.
Polishing Dept. 3½ F.
Kitchen 1½ Chef. Asst.
Engine Dept. 9½
Crank & Wheel Dept. 6½
Milling Dept. 6½
Tool Dept. 7 F.
Ball Bearing 14½ F.
Gear Cutting 11½ F. 7 Asst.
Erecting Dept. 16 G.F.
Carb. Dept. 3½

Executive Commissions

Commissions	Time	Location
Order Commission	8:30 to 9	Engineering Consultation Room
Production Commission	9 to 9:15	Asst. Supt. Office
Other Business	9:15 to 9:15	Asst. Supt. Office
Purchasing Commission	9 to 9:30	Car Order Consultation Room
Mechanical Commission	9 to 9:30	Engineering Consultation Room
Repair Commission	9:30 to 10	Engineering Consultation Room
Executive Commission	On Call	Supt. Office
Salesman Commission	12 A. M. On Call	Engineering Consultation Room
New Order Commission	3:30 to 4:30	Car Order Consultation Room

Figures denote years of Service
G. F. = General Foreman
A. G. F. = Assistant General Foreman
F. = Foreman
A. F. = Assistant Foreman

Factory and Cost Accounting — Planning and Research

23 Asst. Factory Manager. 2½ Sec'y.

Purchasing 2½ 5½ Pur. Agt.
Buyers 3 4 2½ 1
2 8
Purch. Records 2
Gen. Receiving 1½ G.F.
Stock Shed 2½
Wheels & Castings 2
Incoming Freight 10 F.

Stock Room 5½ 6 2½
Cost & Inventory 8½
Pay Roll 11½ 5½ 5
Hospital Sett's. 11½
Employment 2½ 2½
Schedules 8½
Telephones 3½

Assistant Superintendents, Foremen—Sub-Foremen

Day Force		Ratio	Men in Depts.
	28 men	.0368	740
	14 "	.0757	185
	21 "	.0616	341
	55 "	.0925	574
	10 "	.0266	377
	15 "	.0882	158
	13 "	.1040	125
	16 "	.0795	201
	9 "	.0216	416
	27 "	.1607	168
	212 "	.0888	3,685
Night Force			
	4 men	.0706	52
	11 "	.0283	435
	2 "	.5000	4
	4 "	.0167	239
	3 "	.0217	138
	7 "	.0049	145
	1 "	.0333	30
			2
	26 "	.0209	1,045
Total	238 "	.0812	4,650
Day	212	.0888	3,685
Night	26	.0209	1,045
Total	238	.0812	4,650

Factory Meetings

Depts.	Time	Location
Finishing Depts.	Mon. Tues. Wed. Thu. Fri.	Assembly Dept. Locker Room 9:30 A. M.
	Mon. Wed. Fri.	
	Tues. Thu.	
Tool Gear Turning Screw Axle Frame Brass Equip't. Wheel Turning Depts.	Fri. 2 P. M.	Screw Machine Locker Room
Engine and Tool Depts.	Tues. 1 P. M.	Engine Dept. Locker Room
Hardening and Gear Cutting	On Call	
Erecting	On Call	Erecting Dept.

working hours has been considerably reduced. This of itself is a highly desirable accomplishment.

Realizing that proper wages and good shop conditions were the two prime elements in the successful handling of labor, the management has grappled firmly with the problem and is endeavoring intelligently to meet the changed conditions of living and of ideas. A careful study of the cost of living in Cleveland showed that it has increased about two-thirds since 1914. In other words it takes $1 to buy now what could be bought for 60 cents in 1914. With this as a basis the weekly wages have been increased to equal the increase in living cost.

The shop is managed through committees, and here is where the older men are particularly valuable. Their experience, extending back over many years in the shop, makes a most effective balance wheel and aids greatly in securing a safe interpretation of the newer ideas and methods of management. The younger men prevent the management from staying in a rut, and the older men keep the changes within commercial bounds.

Everything is done to make the men feel that they are a part of the institution and not mere cogs in the machinery. The employee is given an opportunity to express himself through shop committees which are elected by the men of the different departments, one man representing approximately ten employees. These committees, which change monthly on the rotary system, meet every alternate week and shop conditions are discussed. The meetings have brought about many improvements and have been profitable to the men and the company. A spirit of friendly interest pervades the whole establishment, and this without any of the paternalism that frequently mars so many well-intentioned plans.

A Coöperative Store

The men run a coöperative store in the shop, hiring their own clerk and directing it by a committee chosen from among themselves. The company furnishes the necessary space rent free. For the present the store confines itself to selling cigars, candy and the smaller commodities.

The company runs a splendid kitchen conducted by competent people, which supplies all or part of a meal at cost or less. The meal includes soup, sandwiches and fruit. Some idea of the popularity of the kitchen may be had from the fact that during 1917 it served 599,280 sandwiches, an average of 2600 a day. The daily average for soup was 1375 bowls; for coffee, 1103 cups, and for milk, 625 bottles. The average monthly income was about $5,000. About 215 office employees are fed in the dining room.

All kinds of healthful activities are encouraged. A band of 40 pieces composed entirely of employees gives a concert in the corridor every Wednesday noon. There is also a glee club and a stringed orchestra. There were two baseball clubs during 1917, which won the city championship, a soccer football club and a ladies' bowling club.

Notwithstanding these features, the management however believes, as stated before, that right wages and proper shop conditions are the first considerations.

No women are employed in the shop, except in the upholstering department, but they fill many office positions.

Perhaps the most startling feature of the management program is the method of increasing wages with fair regularity. The theory is that a man should become more valuable the longer he is with the company. With this as a basis the foreman who does not recommend his men for a raise every six months is called into the office and asked for an explanation. This procedure is so contrary to the usual one of admonishing a foreman for suggesting an increase that it seems almost unbelievable; yet the plan is working out very satisfactorily.

Here then is a clear indication of the trend which is making management more and more a truly scientific problem. The new methods of management must constantly recognize the individuality of the men and must realize that they are in no sense a part of the machine equipment, as they are considered by some of the so-called systems of management. Just how far these ideas can be carried out in other shops depends on divers conditions; in any event they are an inspiration to those who are looking for newer and better shop relations.

The Production of Airplane Propellers

Twenty-five experienced American manufacturers are now producing a total of 350 to 400 highest quality airplane propellers a day for the air service. Ample stock of propeller timber is already purchased or available, and the present supply of propellers in this country is more than equal to the demand.

The number of spare propellers required for each fighting unit was reduced by the air service recently. Hence it has been possible to cut down the original program for the production of propellers.

After the declaration of war the Signal Corps was forced to build up the existing propeller industry and encourage the manufacture of propellers as a new enterprise.

In April, 1917, there were only four airplane companies making their own propellers. Each of these produced propellers in keeping with the requirements of their airplane output. In addition six other companies made spare propellers for airplane companies not manufacturing them and for foreign governments, the United States Army and Navy, private aviation schools and exhibition and amateur fliers. The total output last April was about twenty-five propellers a day.

A Great Development

Since that time a great development has taken place, especially since December, 1917. The older companies have expanded and new concerns have sprung up, due chiefly to the increased demand for propellers and the requests of the Signal Corps. The Government coöperated both in design and production, resulting in the adoption of standard methods and economical manufacture. The treatment of airplane-propeller lumber was worked out, and many special machines and tools were developed and built, materially reducing the amount of hand work previously necessary.

American double-bladed airplane propellers are built up from boards about one inch in thickness cut out to the rough shape of the laminations.

These boards, or laminations, are cut out from carefully selected lumber which has previously been kiln dried to a uniform moisture content of from 6 to 8 per cent., care being taken to avoid casehardening and

too rapid drying, which may diminish the strength of the lumber. The laminations when cut for use in the propeller must be clear pieces, free from defects and with straight grain running along the length of the piece. After cutting to shape the boards are balanced individually and selected according to this balance for grouping together for the complete propeller.

Following this selection the completed groups of laminations are assembled and placed in a hot box to prepare for gluing. With correct temperatures of material and room, gluing is done as rapidly as possible and the glued-up blocks left in presses or clamps to set for 24 hours. The blocks are then cut down by carving machines, lathes, shaping machines, etc., to within ¼ in. of the final finished size and shape, and in this state are hung for two weeks in a conditioning room before being worked to the final finish.

The Final Finish

The final finish is done on the bench and completes the propeller to the point of being ready for varnishing or covering. The bench work is done with great accuracy so as to conform exactly to the desired pitch and shape and to have the two blades in exact alignment and track. The propeller, acting as a flywheel for the air motor, must be perfectly balanced. When the propeller is finished in the "white" it is ready for inspection of glue joints, dimensions and balance, after which it is finished with five coats of spar varnish and rebalanced.

Some propellers have the tips covered with copper or linen fabric to protect them against splitting, which results from picking up sand, running in long grass or in the rain.

Opinion is divided as to the best wood for propeller purposes, but the practice of the French and English governments favors walnut and mahogany for combat blades, the former being considered best. Other woods have been extensively used for training-type propellers, principally quarter-sawed white oak, birch, cherry and poplar. Originally the walnut used by the French was their own French walnut, but this wood is no longer available. American black walnut has taken its place, and large quantities have been exported to England and France for propeller purposes and to make rifle stocks. Today the available supply of black walnut is limited by the ability of producers to obtain the scattered timber, and the demand is greatly in excess of the supply. The exclusive use of black walnut for rifle stocks manufactured in the United States has an important bearing upon the available supply for propellers.

All the mahogany used has for the past four years been exported as lumber from the United States, having been imported in the log from Central America and Mexico. Some of the largest and best tracts of mahogany timber are in British Honduras. This is being cut under the direction of the British Admiralty and brought into the United States for manufacturing into propeller lumber before exporting to England. Large quantities of British Honduras mahogany and other tropical mahogany have been exported so that the existing situation is one wherein the available supply is just about adequate for the combined demands of the Allies and the United States provided restrictions are placed upon the use of mahogany propeller stock for commercial purposes. This situation, affecting the manufacture of furniture, pianos and the like, can be relieved by the use of substitutes such as Philippine mahogany, which is lacking in some qualities required by the specifications for propeller wood.

It is believed that quarter-sawed white oak will come to be used more generally on account of its greater strength and the necessity for getting maximum strength in the propellers used on the newer high-powered, high-speed engines.

The amount of wood in the present two-bladed propellers varies from 30 board feet in a training type to 80 ft. in a combat type. These figures are net, while the gross lumber required to manufacture will be about twice the net amount in both instances.

Many attempts have been made to design and produce a metal propeller, but to date no tests reported have been sufficiently successful to put into production. The difficulty is to construct the blade light enough and strong enough to resist the tensile and bending strains set up. Propellers have been manufactured from a material called Bakelite, a canvas and acid glue shaped under hydraulic pressure at a high heat. To date these have been successful in destruction test and flight. They weigh slightly more than wooden propellers of the same design but have greater resistance to wear and tear.

The General Theory

The general theory in determining the number of blades is based upon the double requirement of developing the maximum efficiency of the engine horsepower, eliminating resistance losses and at the same time developing a blade that will be adaptable to the construction of the complete machine.

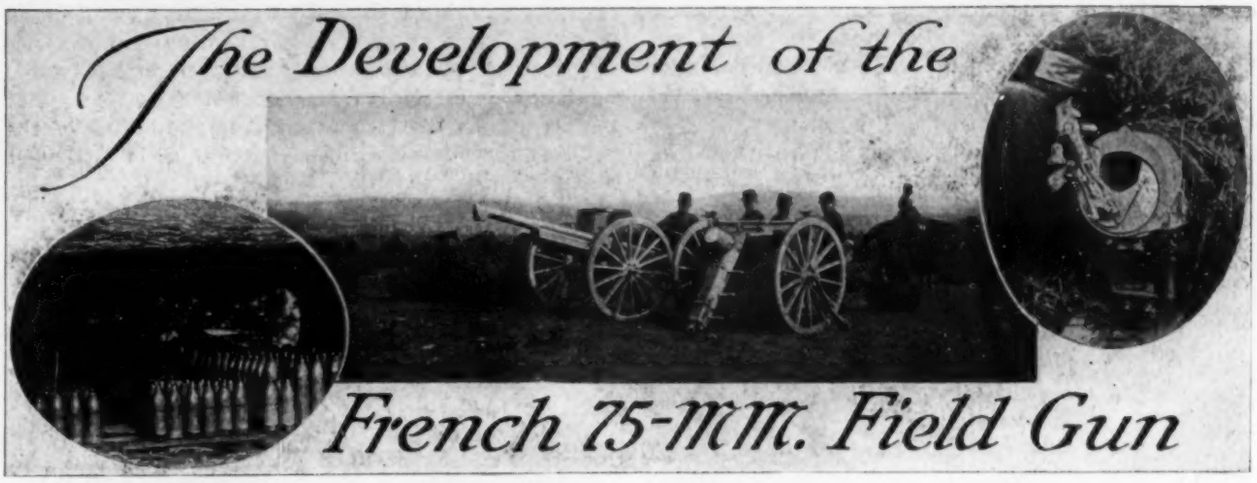
The greatest efficiency is always obtained by a two-bladed propeller of the largest diameter that the engine will turn at the correct engine speed. In this way the propeller has an effective thrust over the maximum possible air area with least blade-surface resistance.

In many cases, however, the construction of the plane is such that a two-bladed propeller of sufficient diameter cannot be used on account of clearance, and the three or four-bladed propeller is adapted to take up the full horsepower in effective thrust in spite of greater resistance losses. The four-bladed propeller is generally used instead of the three because of its simpler and stronger construction features. The two-bladed propeller is more efficient than the three or four, and would always be used if the arrangement of plane and engine permitted.

New Officers of the American Society for Testing Materials

At the twenty-first annual meeting of the American Society for Testing Materials held at Atlantic City June 25-28 the following officers were elected: President, G. H. Clamer of the Ajax Metal Co., Philadelphia; vice president, G. S. Webster, director of the department of wharves, docks and ferries, Philadelphia; members of the executive committee, G. Aertsen, Midvale Steel and Ordnance Co., Philadelphia; Dr. George K. Burgess, chief of the department of metallurgy, Bureau of Standards, Washington; Dr. G. B. Heckel, editor of *Drugs, Oils and Paints*, Philadelphia, and K. W. Zimmerschied, metallurgical engineer, General Motors Co., Detroit.

The Development of the French 75-mm. Field Gun



By J. A. LUCAS

The 75-mm. gun used as a light field gun by the American Army in France is the result of experiments and calculations by French artillery experts based on data of gun performance during the Austro-German war of 1866. This article deals with its invention, construction and operation during the years of its use.

DURING the Austro-German war Austria had only muzzle-loading field guns, while Germany was equipped with guns loaded from the breech. The superiority of the German guns during that war was observed by France, which determined to develop a gun superior to the one then in use by the Germans. The result was the 90-mm. breech-loading gun, of which a number were in use during the Franco-Prussian war of 1870. At the beginning of the present war many of these guns were still in the arsenals of France and were successfully used as semi-heavy artillery. However, the 90-mm. gun lacked precision and could only be fired at the rate of one shot a minute.

What was needed was a gun adapted to quick firing and having a greater degree of precision, since the original 90-mm. gun required resighting after each shot was fired. The problem of designing such a gun was then occupying the minds of the artillery experts of the world, and was clearly outlined in 1880 by General Langlois in a series of lectures before the Academy of War.

Early experiments were conducted by Locard, Piffard and Ducros, but while acting as a guide for further study they were not in themselves satisfactory as a basis for new gun designing. In 1849 Colonel Duport, director general of the arsenals of Puteaux, took up the problem, and in a short time presented to the Minister of War the design of a gun which embodied the principles of the present 75-mm. gun, including absorption of the recoil by hydropneumatic cylinders. This gun was finally built and brought to perfection by Capt. Sainte Claire-Deville, now a general at the front, and by Captain Remailho, who was also the inventor of both the 105-mm. and the 155-mm. guns. They made several additional improvements in the gun, such as the automatic discharge of the shell and the reversible armored caisson. The details of this gun were so well guarded that the whole secret has not yet come to light, but the general design was stolen and taken to Germany and incorporated in the design of their 77-mm. gun. This was regarded by the Germans as a triumph. The first 77-mm. gun built by the Germans was late in 1896, while the French had their first 75-mm. gun finished early in 1897. The French gun was much superior to that of the Germans, as will be demonstrated later on, but this the Germans would never admit; they had built their gun at great expense and kept it, always claiming its supremacy. The barrel of the 75-mm. has a total length of 33 calibers (2475 mm.) and is composed of nickel steel combined with other alloys, the nature of which cannot be divulged. These alloys are intended to add tenacity and resistance. A conception of the general details of the 75-mm. gun can be obtained from Fig. 1 as it stands ready in firing position with the protection shield *A* tilted nearly in a vertical position and the anchor spuds or brakes *B* below the wheels to prevent movement when fired. It will be noticed that the trailer arm also has a heavy prong or crotch which imbeds in the soil to resist the recoil on firing, although this would be impossible were it not for the peculiar design of the barrel and recoil cylinders, which minimize the amount of recoil pressure to be absorbed by the carriage and trailer.

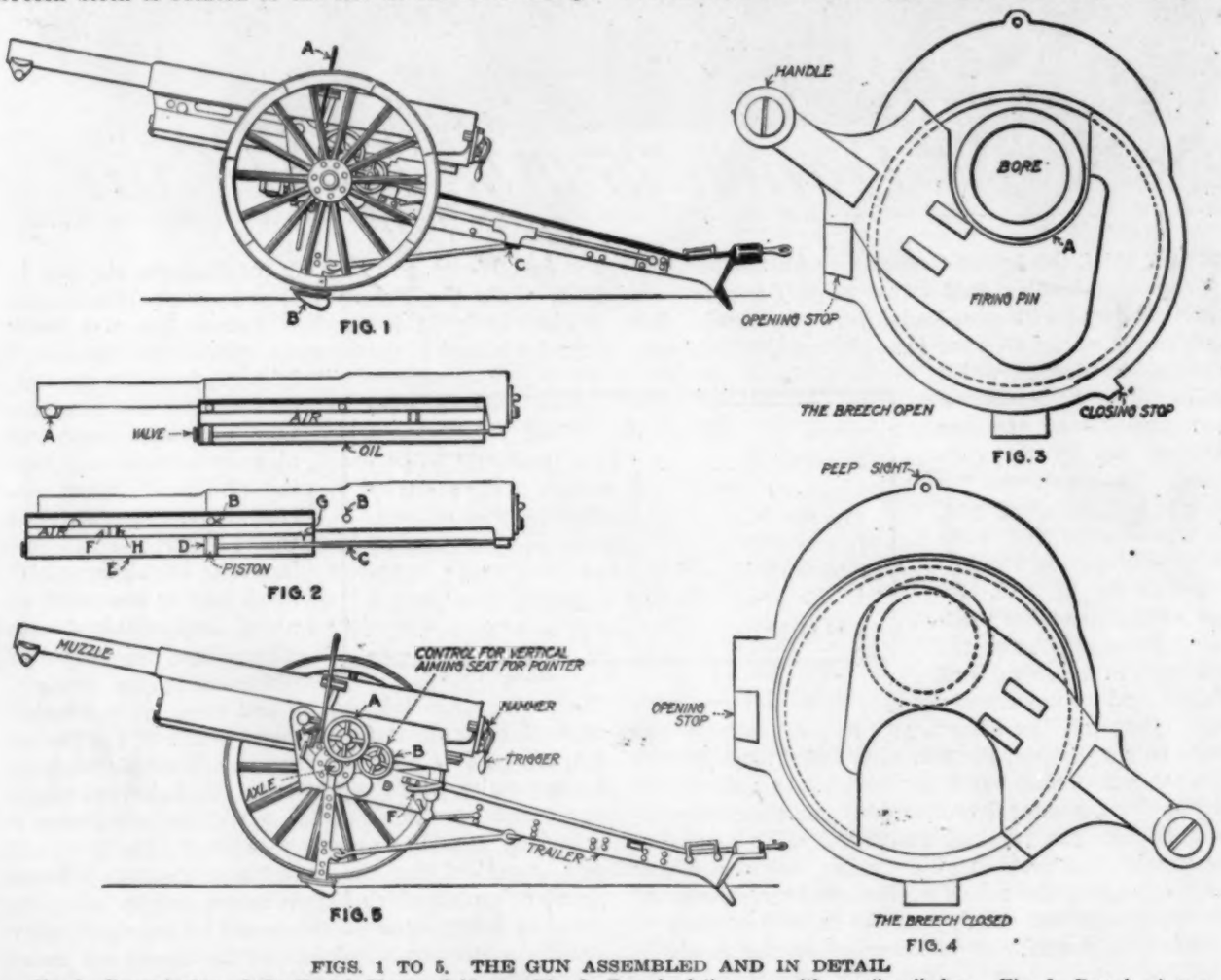
When the gun is standing in firing position the anchoring part *B* below the wheels is connected by a bar with the brake slide *C* that slips back and forth on a bar attached to the side of the trailer. When the trailer is lifted from the ground the slide is moved toward the end, which pulls *B* from under the wheel and part way up on its rim. In this position it will then act as a brake on the wheel, when desired, as when running down hill.

In the old 90-mm. gun the reinforcing bands were slipped on while hot and were shrunk tightly in place by cooling. It was found that the shrinking process had a tendency to disturb the molecular structure of both the bands and barrel with a consequent reduction in their strength.

For the barrel of the 75-mm. gun, shown in detail in Fig. 2, a jacket was used in place of shrink bands. This was first carefully bored to fit the external diameter of the barrel, and after being placed in position was com-

pressed tightly about the barrel by the immense pressure of a hydraulic press. The final boring of the barrel and the rifling are not done until after the jacket has been compressed, as the great pressure applied tends to slightly close in the bore.

The breech of the gun is bored eccentrically with the axis of the barrel, and is provided with a coarse female thread into which the breech block screws. When the breech block is rotated to the left as far as it can go



FIGS. 1 TO 5. THE GUN ASSEMBLED AND IN DETAIL

Fig. 1—General view of the French 75-mm. field gun. Fig. 2—Barrel of the gun with recoil cylinders. Fig. 3—Breech of gun open—position showing eccentric bore. Fig. 4—Breech closed by 180 deg. turn to the right. Fig. 5—View of principal operating features of gun

the semicircular slot *A*, Fig. 3, uncovers the bore of the gun and permits the insertion of the cartridge.

Rotation of the breech block 180 deg. to the right brings the slot to the bottom of the gun, thus closing the breech and moving the breech block forward a distance equal to one-half the lead of the screw. This forward motion forces the copper band of the projectile against the ribs of the rifling. Fig. 4 shows the breech closed.

The important feature of the 75-mm. gun is the device for absorbing the shock due to recoil. The barrel is attached to the carriage by a slide on which it is free to move longitudinally in either direction, the amount of movement being limited by stops *A*, Fig. 2. As the barrel travels back it is guided along the slides by the rollers *B* which prevent it from rotating about its longitudinal axis. The final length of travel is limited by the heavy stops *A* on the outer end of the muzzle of the gun, which, though rarely acting, will in an emergency come up against spiral-spring cushions, not shown, prepared to absorb any excess of recoil. In this detail section of the recoil cylinder it will be seen that one end of the rod *C* is attached to the breech of the gun and the other end to a piston *D* in the cylinder, which is filled with oil or glycerine.

Above cylinder *E* is a smaller cylinder *F*, about one-fourth filled with oil or glycerine, and this is connected to cylinder *E* by a small hole *G* in the dividing wall. In the front end of the smaller cylinder air is confined at a pressure of 120 atmospheres. Between the air and oil is the sliding block, or piston *H*, to keep them separated. Thus when the gun is fired the force of the recoil drives the barrel to the rear, and as the piston must move with the barrel this movement drives the oil from the lower into the upper cylinder through the small hole *G* against the air pressure in the upper cylinder, thus absorbing the recoil force by having to further compress this air. As soon as the force of the recoil is spent the compressed air forces the oil back into the lower cylinder, moving the piston with it and returning the barrel to the position occupied before firing. The motion of the barrel due to recoil is 1.20 meters, and the time required for the recoil and return is less than a second. An interesting feature in the design of these cylinders was the determination of the

correct size of hole for the oil passage; this if too large would not sufficiently limit the recoil, and if too small would cause the walls of the cylinder to break unless great additonal weight of metal was added to increase their thickness.

This absorption of the recoil with but the minimum possible jar on the carriage and instant return of the barrel after each shot to its original position enables

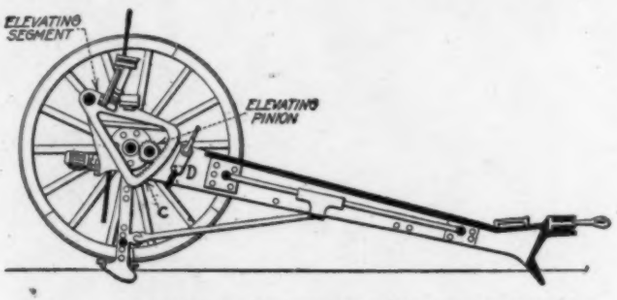
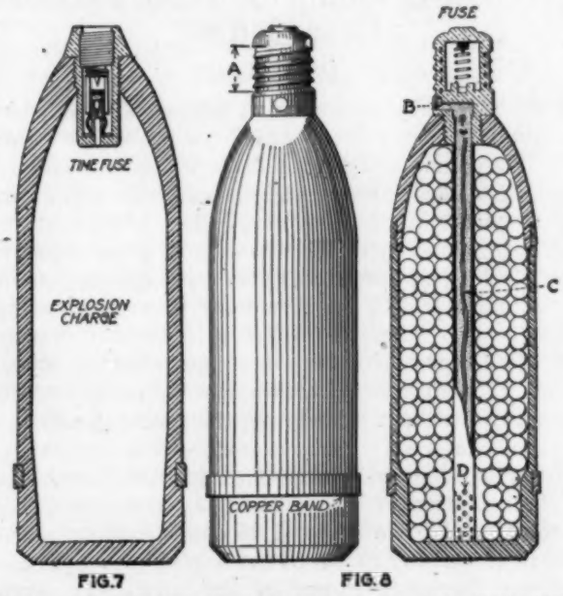


FIG. 6. SECTION SHOWING ELEVATING SEGMENTS FOR RANGE SETTING

the gun to be fired many times without resighting. Obviously firing can be done with great rapidity, and during the battle of the Marne it reached a speed of 27 shots a minute.

Although there is little movement in the position of the gun after the first shot certain alterations of the position of the barrel will constantly be necessary, due to changes in the range or movement of the objective. The 75-mm. gun is well able to take care of certain amounts of lateral movement which distinguish it from



FIGS. 7 AND 8. HIGH-EXPLOSIVE SHELL AND SHRAPNEL

its predecessors. To obtain this result the barrel is attached to the trailer or carriage by an intermediate mechanism, so that the grip on the axle is not fixed and the barrel may be slid sideways when necessary as well as turned by what is termed the traversing movement.

By reference to Fig. 5 two handwheels will be found near the center axle. The larger of these *A* controls the traversing movement of the gun barrel. After the location of the target has been signalled to the gun pointer by means of this traversing handwheel the gun is rotated on its central vertical bearing until the exact location indicated is fixed horizontally in the panoramic sight, which was described on pages 177, 285, 373, 543, 719 and 849, Vol. 47. Having thus found the horizontal position the gun is ready for elevating for the necessary range, which is done by the smaller handwheel *B*. This handwheel operates a pinion meshing into a circular rack termed the elevating segment, and by reference to Fig. 6 this elevating segment is found as part *C*.

After the barrel has been elevated to approximately the correct angle it is locked by a hand nut. Further elevation for fine adjustment is obtained by the micrometer through screw *D*, which is connected to the segment, and is turned through a set of bevel gears operated by a small handwheel. When in action the gun pointer remains seated in his position on the small seat *F*, Fig. 5, and it is his sole duty to keep the gun constantly pointed at the target as indicated in the panoramic sight, a target which he only knows as existing in a certain position of the crosslines of this sight, since in modern artillery battles the target is very rarely in direct view of the gun. So controlling the position of the gun whenever a discharge may slightly alter its position he instantly restores it, the loading and discharge of the piece being duties of other members of the gun crew. The cartridge of the 75-mm. gun consists of a brass casing carrying the firing charge and combined as a single unit with the shell. The casing is of the rim type, and the base is provided with a hole for the insertion of the percussion cap; a small band attaches the casing to the shell.

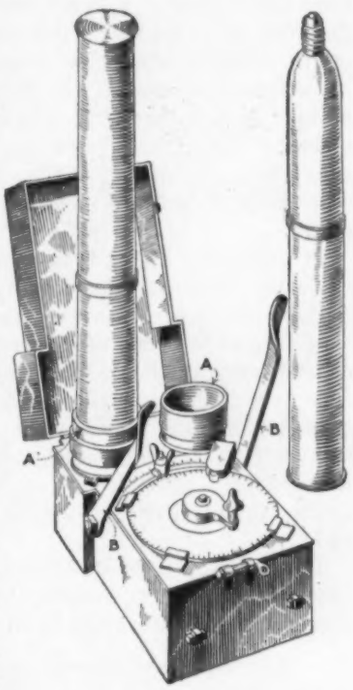


FIG. 9. TIME-SAVING DEVISE

There are two general types of shells in use with this gun—one of the high-explosive type called the "demolishing" shell, which after it forces its way through an obstacle has great destructive effect as it explodes. The explosion also breaks it into upward of 2000 pieces which cover with killing effect a radius of about 60 ft. The effects of shell shock from this explosion also add greatly to its killing effects, and are usually deadly within a radius of 15 to 20 ft. This shell is charged with melinite and is illustrated in the sectional view, Fig. 7. It is also being used by a new method so that it rebounds from the ground after its first fall; on this rebound at a height of from 3 to 6 ft. it explodes with deadly effect.

The best-known shell for the 75-mm. gun is the shrapnel, each loaded with 250 bullets of an alloy of lead and antimony. These bullets, as distributed

through the shell, are mixed with black powder. By reference to Fig. 8 it will be seen that a heavy nose is screwed in a thin-walled shell body. As a result of this thinness when the powder is first ignited a slight expansion of the walls instantly results; this partially loosens the threaded section of the nose, and as the explosion takes place this nose is projected forward, leaving the end of the shell, and from this the lead bullets are projected, covering the field in front of the point of explosion. This shell explosion increases the velocity of the bullets about 300 ft. a second above that of the shell at the time that the explosion occurs. The shell itself separates into an average of 20 pieces which go hurtling through the air damaging all in their path.

An interesting feature of this shrapnel shell is its time fuse. In Fig. 8 it will be seen that the fuse is in the form of a spiral thread between the limits shown at *A*. After cutting this spiral groove a fuse of ignitable material is laid in the bottom of the groove and covered with a thin strip of soft metal that is held in place by rolling over upon it the top of the thread, thus effectually sealing it throughout its length against unintentional ignition at the time of discharge of the gun.

In this respect this type of French shrapnel differs radically from the American type; the latter receives its ignition by a percussion effect brought about in the time fuse at the time of discharge, whereas the former depends upon the flame of discharge igniting this spiral fuse in a determined place, whence the fire in the fuse travels along the spiral, then down through the connection *B*, passing through the long fuse *C*, carefully inclosed in a tube, to the base of the shell where it ignites the shell charge through the holes in the tube at *D*.

The determination of the point at which the spiral fuse will be fired is done by the interesting auxiliary time-setting device shown in Fig. 9. In this device the

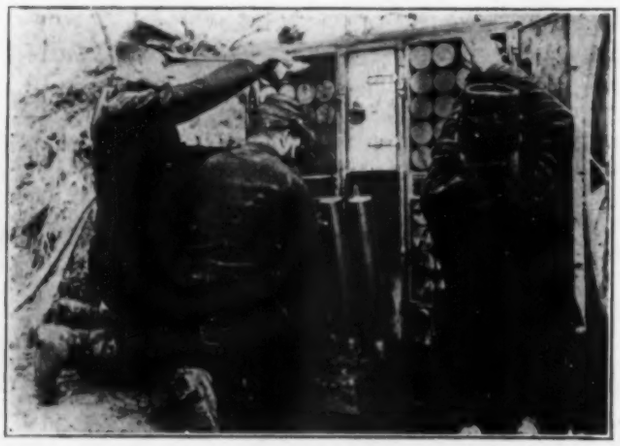


FIG. 10. TIME-SETTING DEVICE IN ACTUAL FIELD SERVICE

shell is stood nose down in either one of the two sockets *A*; the two are identical for this purpose, and in one a shell is standing in position. The range being determined on the graduated dial, and set accordingly, the lever *B* is pushed down. This operation on the lever pierces a small hole through the thin metal over the spiral fuse which will ignite at this determined point.

The operation thus performed is illustrated in Fig. 10, where two men are placing shells in the time setter which the center man is operating.

One of the worst handicaps of a quick-firing artillery piece is the heating of the barrel, due principally to the combustion of the firing charge and partly to the friction of the shell passing along the rifling. The high grades of alloyed steels used in the construction of the

FIG. 11. BREECH OF GUN OPEN RECEIVING CHARGE

75-mm. gun has given to it remarkable power of endurance to resist this wear, so that it may be fired almost indefinitely without interruption. Many of the field pieces of this type in use at the beginning of the great war had been in service for nearly fifteen years.

Hollow-Grinding the Tooth Face of Gear Cutters

By Oscar Craft

I have recently conducted a series of experiments in grinding gear cutters, and have evolved a method of hollow-grinding the tooth faces which seems to give more of a shearing cut than when they are ground square across in the usual way. The teeth of a gear of cast iron made with the hollow-ground cutter present a polished appearance, and I think that a cutter ground in this manner will do more work between grindings. There is a slight curl to the chips from such a cutter, indicating to my mind the presence of a certain amount of top rake that is not ordinarily obtained, and this is secured without sacrificing the radial position of the tooth face.

To grind a cutter in this manner put a saucer wheel on the spindle with the convex side out and swing the machine table to an angle of 45 deg. With a diamond held in the truing fixture dress a surface about $\frac{1}{16}$ in. wide on the outer corner of the wheel. In setting the table for height it is important that the center of the wheel spindle and the center of the cutter should coincide. The face of the cutter tooth must be brought into parallelism with the travel of the machine table, and this may be best accomplished by fastening a small parallel to the face of the tooth, and then passing it back and forth across the wheel by means of the table traverse until the wheel touches evenly at all points.

The cutter should now be clamped, the parallel removed and the table advanced to bring the cutter into contact with the wheel.

Development of Flaws in Hollow Forgings

By A. S. HESSE

Certain methods when employed in hollow-forging large pieces, such as gun or tube forgings, have a tendency to cause injury to the steel, which results in the formation of serious flaws. The writer of this article discusses some of these faults and suggests the proper remedies.

THERE are three mistakes sometimes made in the production of hollow forgings which will cause serious flaws to develop in the piece of steel being worked. These are using too small a mandrel; using flat dies in the hydraulic press or hammer, and working the metal too cold. Any one of these is bad practice, but the first is by far the most serious, and when that mistake occurs in combination with either or both of the others then the chances for producing really good forgings are very small.

Carelessness or too much haste on the part of the workman usually is the cause of working the steel when it is below the proper forging temperature.

To consider first the simplest, and probably the most common, difficulty in this connection an example is given in Fig. 1, which shows what may occur when a mandrel that is too small is placed inside of a hollow forging which is being worked under either a press ram or hammer die. In the first case the mandrel *A* has worked off of the exact center, and while the steel of the forging is being stretched and worked at the points *B-B*, as is proper, still the mandrel is so small and so far to one side that the material at *C*, on the inside of the ring, is being worked into the form of a V as shown.

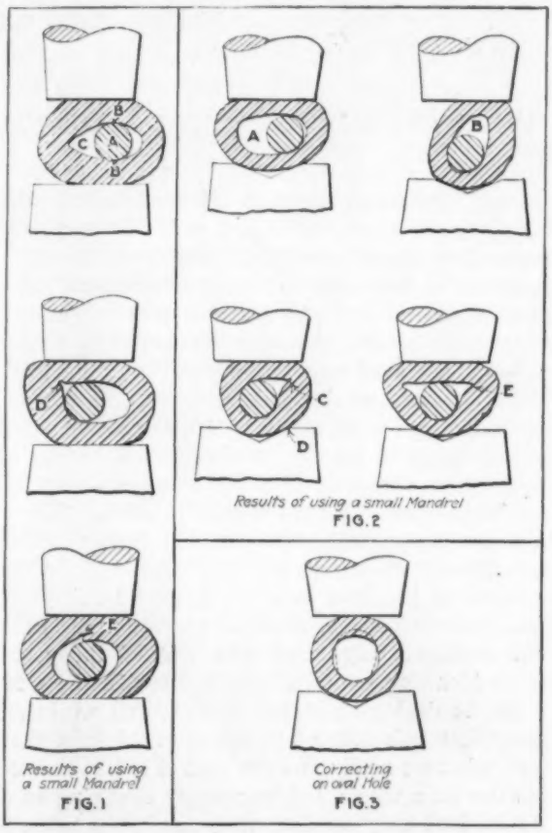
The ring is next given a partial turn, the mandrel probably shifted a little, and a second squeeze or blow applied. The wedge-like opening which was started at *C* is given another pinch and its sides begin to close together as at *D*. Even if this V were immediately worked out by placing the mandrel below it and applying the pressure correctly there would still be reason to believe that the stress on the structure of the steel at the point of the V would create a degree of irremediable damage at this point which would encourage the starting of a fracture later.

However it is just possible that this fissure at *D* will not be seen in the interior of a long, hollow forging, and the operator in proceeding with his work ultimately crushes the sides together about as shown at *E*. There is little doubt that those acquainted with the mechanical forging of steel will agree that no matter whether the seam so formed extends deeply into the material or not the stress which has been developed will be a vital factor in the ultimate strength of the piece.

When the forging is worked with a shallow V-block for the lower die there is little tendency for the hole to grow oval on one side of the mandrel because the action of the V-block itself tends to throw the mandrel into the center; but by applying great pressure with a small mandrel the hole will become an elongated oval as shown at *A*, Fig. 2. When this piece is turned around 90 deg. or more the long axis of the oval has just as much chance of being to one side, as shown at *B*, as it has to be directly under the vertical stroke of the ram. In such a case the oval end will be crowded down to one side in the manner shown at *C*, where the start of a bad V-seam is indicated. With a V-block that is too small the flow will be increased by the corner *D* crowding up on that side.

The fault caused by a mandrel that is too small can hardly be avoided even where the long axis of the oval hole is placed exactly vertical, for, as shown at *E*, the forging is squeezed down with the tendency to form seams on both sides.

Should the bad practice indicated be used in rough



FIGS. 1 TO 3. VARIOUS FORGING PROBLEMS

working any portion of a long forging until it has been drawn sufficiently in a single heat and the smith goes back over it to finish or round it up the corners which have not been entirely worked out (and probably could not be satisfactorily worked out) will, at the lower temperature of the steel, have an even greater tendency to crack or fold over.

The proper solution of the whole difficulty would be at the start, after stretching the band sufficiently over a small mandrel to the point where a decided oval hole began to form, to immediately put it under the press in the position shown in Fig. 3, and by squeezing the oval into nearly a circular shape make it possible to insert a larger mandrel before continuing the stretching of the ring or tube.

Seams which were formed as very minor affairs at the start will work or "travel" along and grow deeper should the smith start going over the forging a couple of times to round it up. It is advisable to work with the intention of keeping the hollow tubes or rings nearly round as the work goes along, even during the roughing strokes of the hammer or press. Good work should be insured even though it might be necessary to reheat more frequently. The best practice is to draw and finish a section and stop when it no longer draws on account of the low heat and only bends from one oval axis to another. To then continue working the hollow forging at a lower heat will surely create a tendency to crack.

When flaws are formed in the interior of long, hollow forgings it is practically impossible to so inspect the rough forging as to detect them. If they are very deep and serious they may show as seams after a boring cut has been put through, or they are just as liable to exist as strained and weak points in the forging, which will only be detected when the completed parts rupture under extreme pressure in service.

What Is an Employment Manager?

By Entropy

Merely conferring the title of employment manager on a clerk does not make him one. Hiring men and sending them to different departments of the shop does not make the man who does it an employment manager. Yet there is no law and little custom to frown upon either of these men for calling themselves by that name.

An employment manager should be a man who is capable of ranking alongside the works manager, the sales manager or the auditor. He is not only the purchasing agent in respect to the largest buying which his company does—its working force—but he has the most fluid material with which to deal. The works manager has certain very specific things under his charge, most of which will stay put. If he unloads a carload of pig iron at night he has a fairly definite idea where to look for it in the morning. The employment manager may know who worked today, but he has no idea as to who will be present in the morning. He has to deal with human nature, and while we like to say that this latter has not changed in a thousand years, what we really mean is that it is like the ocean—the same as a whole, but ceaselessly changing in detail.

If he had only to deal with the mob, the employment manager would know very well how to do it; but the individual strike, the man who quits arbitrarily and goes on to the next job, is more prevalent and more costly than the mass strike. Any shop losing a quarter of its force all at once by a strike which lasts two weeks will tell us in doleful tones how much it lost. And yet that same shop will watch the equivalent of its full force walk away one at a time in less than a year and never see the point when it is indicated to them as an expensive practice.

The employment manager, then, should be a real man, for he has a man's-size job. He is not yet, except by the most far-seeing employers, accepted as a necessary factor in the conduct of their business. A few, a very few, concerns have developed definite views concerning the promotion of good relations between themselves and their employees, and in such a concern the post of employment manager is one sweet dream compared with those places where the same idea has come to but one or two of the powers that be and has not yet been absorbed by the rest of them. The employment manager in such a firm has an uphill fight, because he is never in a position to definitely prove that his work has paid in dollars and cents.

This fact makes it necessary that the job shall be handled as a service job. Unless his superiors demand it, it is better that his services shall not be given except to those who call for them. This is a slow way to get started, but if there is any division of opinion or disloyalty to established and authorized practice it is better to go slow. Fortunately the newer concerns find themselves unable to organize on a large scale without the aid of an employment department. Its services are necessary, and because of this the employment manager is placed in position to render a service that will be appreciated at once.

If a man is to do his full duty he must be in position to make any recommendation or criticism to or of the management that may seem desirable to him without danger of losing his job. It is usual for him to come into the organization under the official most interested in his work, and if that individual is the general manager he is fortunate, for that is where he should be in any case. It is necessary that he should have access, without knocking, to the man to whom he is responsible, for he will many times have to decide in cases in which even a short delay may mean the start of labor unrest. Every shop has instances where an injustice is being done an employee, which can only be straightened out by the highest authority. Such a case may lead to serious unrest and may cost many dollars solely because of lack of prompt treatment.

Question of Authority

Failing access to the general manager the employment manager needs the authority which is usually possessed only by that official, and which the latter seldom likes to share with another. In fact, for the most part, the employment manager is better off without exercising authority to any great extent. Theoretically he wants nothing from anyone that cannot be proved to be for the best interest of all. There are times, however, when waiting until some foreman of the old school sees things in their new relation may cost the services of a man who is very expensive to replace. Then a little authority is a nice thing.

If the employment manager is to be a manager in fact as well as name it appears that he will have to be manager by virtue of what is in him rather than by authority. If that is so then there can be little question but that he should be a man used to holding responsible positions and one who can command the respect and attention of men high up in the organization. Such a man will not accept a position which does not make him an executive. No clerk's job will have any attractions for him. He will make a job for himself if given half a chance, but it will not be any small job. If he cannot stand on a level with the works manager and superintendent he will not find the work attractive, and if he is not competent to stand there the company should change men.

The Interest of American Machinery Manufacturers in Russia

BY STERLING H. BUNNELL
Chief Engineer R. Martens & Co., New York

This article briefly outlines the conditions in Russia today and makes some helpful suggestions as to the proper course for manufacturers to follow.

SINCE the United States cast its lot with the Allies the most perplexing and disturbing factor in estimating the probable progress of the world war has been the course of affairs in Russia. Immediately after the Russian revolution the patriotic and experienced members of the Duma, which formed the first temporary government, pledged the army and the nation to continue the struggle against Prussian domination, and the armies of the Central Powers faced defeat from impending attacks on eastern and western fronts together. With their usual skill in treachery and deceit the German leaders saved the situation by flooding Russia with funds for the support of all the visionary idealists and embittered exiles who had seen the evils of the Russian autocracy, and the fixed purpose of the Russian nation to defend itself during the working out of a popular government evaporated in the heat of endless street-corner speeches, extremist newspapers and general inattention to the business of every-day life.

DIFFICULT TO UNDERSTAND

It is hard to understand how Russia's final desertion of her allies could have come about as it did without the intentional treachery of the Russian people. The fact is that the Russian people were and are down and out. They had lived for years by selling grain and buying tools, clothing, machinery and nearly all manufactured necessities from Germany, receiving these things by railroad overland or through convenient ports on the Baltic Sea. During three years of war this trade had been entirely cut off, and little could be done by Allies or neutrals to make up for it through the restricted capacity of the railroads from north Sweden, Norway, Archangel and Vladivostok. It was the failure of the imperial Russian government to provide for the distribution of sufficient food to the city workmen at fair prices that brought on the revolution which wiped out every trace of legal authority from Czar to policeman. It was then the general idea that higher wages would make up for the high prices of supplies. No one was capable of teaching economic theories to the million of workers, and so wages were forced up until the goods left in the stores were bought out and the workers found themselves with plenty of money and nothing to be bought. Having no use for their wages, they took holidays in the pleasant summer weather and listened to agitators, who talked of a capitalists' war and the willingness of the German people to make peace with Russia, until all Russian industry fell to pieces. The devil's work had been well done, and in the winter, having neither food, fuel nor work, the morale of the nation was broken, and the Germans were able to sweep up the whole supply of Russian army stores and transport them with the released armies of Germans and Austrians to double the force against us and our allies in Belgium, France and Italy.

Whatever may be said of the turpitude of the Bolshevik leaders who brought about Russia's final surrender, the fact remains that the Czar's half-equipped peasant soldiers had been marched by millions to unknown and unrecorded graves and that the bravery and devotion of these men had repeatedly forced the German leaders to withdraw armies which were near victory on the western front. The Russian soldier was ordered from home on the day of mobilization to be marched under orders to an unknown destination and fight for an unknown cause. His wife and children parted from him at the railway station as from one who would never return. No news of his life or death would reach those at home, and no casualty list would record his fate. If maimed in battle his discharge would leave him a crippled beggar. While the German soldier went to war in a frenzy of patriotic enthusiasm for Kaiser and German glory, the Russian peasant knew nothing of the cause for which he fought so bravely under orders. With the collapse of the Czar's government the Russian army melted into a good-natured mob of comrades who had lived and suffered together, and now wanted nothing so much as to be allowed to stop killing other peasants and go home. Of all the disappointments which have come to the Russian peasants and workmen in the events since the revolution none can have been more bitter than their gradual awakening from their dreams of peace and plenty under international Socialism to find themselves helpless in the grip of a foreign despotism, more severe than that of the imperial Russian government, ruthlessly exploiting and robbing them in defiance of the treaty of peace.

FACING A FAMINE

Russia faces today the most terrible famine in history. Agricultural tools and machines are worn out, and none can be had in Russia to replace them. Previous crops have been left in the fields because the grain-handling middlemen were suppressed by the Socialist governing committees, and because the peasant farmers knew that the labor of harvesting could bring them nothing but money, useless in the lack of clothes, boots and implements to be purchased. Where great crops of grain used to be raised, the peasants are this year planting only trifling amounts for their own needs. The cities, always dependent on the country for food, have nothing but depreciated paper roubles to give for grain, but the peasant wants supplies, not paper. Troops of German cavalry have combed the country to find and seize what small stocks of grain may exist in a land which has neither farmers' barns nor elevators, and

their methods offer no encouragement to the peasants to work hard in raising crops which would be seized at harvest time.

While it is now too late to save Russia from terrible suffering, due to the industrial disorganization, it is of the greatest importance to the cause for which we are at war to see to it that we the Allies show the Russians by quick and effective help that their interests lie with the democracies of the world and not in reorganization under the military efficiency of Prussianism.

Russia is in desperate need of supplies for the civilian population. The necessities begin with clothes and boots and continue with farm and trade tools, mining equipment, railway locomotives and cars, machine tools and every kind of industrial and factory machinery. The quantities required to refit the population of 170,000,000 will tax our utmost production for several years to come. These things cannot be supplied by the Germans until the pressure of war is removed. But if in the interval before our final victory we should refuse to the Russians the supplies which the Germans profess to be ready to furnish, we should find at the close of the war a pro-German sentiment in Russia so strong as to make Russia nothing but a huge extension of Germany, in spite of any power we may then possess to dictate forms of government or annul German-Russian treaties. We might win the war and yet leave the world absolutely powerless to resist German commercial domination supported by Russian coal, oil, metals and agriculture.

The Importance of Export Trade

We hear and think much about the importance of export trade and the profit it brings to a nation. The greatest opportunity ever offered is now ready for us. Russia possesses even now immense quantities of raw material without the equipment to manufacture them. These materials, comprising hides, flax, bristles, furs, minerals and agricultural products, are at present in the hands of individuals and corporative societies wanting to sell them and buy manufactured goods from abroad. The shortage of these raw materials is acute, and it only needs that working arrangements be made between financial groups in Russia and America in order that these materials may be shipped here and sold for dollars in our markets, and those dollars used to purchase the machinery and supplies needed in Russia. The Russian materials are to be delivered by their owners at seaports, consigned to an American agent. The American machinery and supplies are to be bought with the money received from selling the Russian materials here. The details of the plan are being worked out by those interested, in connection with representatives of machinery and other houses concerned in sales to Russia. Care will of course be taken to ship goods only to such parts of Russia as are able to maintain their rights in their purchases and keep them out of German hands and free of military seizure.

To manufacturers of machinery no country in the world presents such enormous opportunities as the lands of the former Russian empire. Under the imperial government it was the policy of the ruling class to trade with foreign countries for the major part of the manufactured goods required and pay in grain raised by cheap labor at small cost. The trade was profitable, and the leaders therefore saw no object in improving their own country by education and the introduction of better methods of work. Germany was situated in a position to take full advantage of the opportunity. Most of the machinery bought by Russia came from Germany. Not all, however, was made in Germany· large numbers of American-made machines were bought by German firms and supplied with German trademarks in place of the American names. In many cases when such machines sold well in Russia they were copied in Germany by the German selling agents, who continued to buy a few in America so as to keep the original manufacturers from suspecting that their trade was being stolen. The Russians are therefore not unfamiliar with American machine tools and manufacturing equipment, though they suppose much of it to be German.

Russian Industries Undeveloped

While Russian industries are largely undeveloped, and meager and primitive equipment is common, a good deal of the introduction work has already been done, and many proprietors and managers of factories have decided to install modern machinery as soon as they can get it. As these plans are carried out, the newly equipped industries will naturally follow the practices of the nations making their machinery. We and our allies must not allow the industries of nearly two hundred million people to be dominated by Germany and directed toward the support of a mighty German-Austrian-Russian empire in that "next war" which the Prussian leaders openly plan and discuss today.

Two points of interest to machinery manufacturers stand out clearly. One is the magnitude of the Russian market. Even though we double the greatest estimates of the possible growth of Russian industries following the war, it will be years before the people of Russia can supply their own needs in clothing, boots, farm tools, machinists' and trades-workers' tools and supplies, and all the manufactured goods that are necessary to our daily lives and will become necessary to the Russians as their national life develops. There is no end in sight to the market for American machinery in Russia, no matter how fast we may be able to equip Russian factories to manufacture for their local needs.

The other point is the very important difficulty of language. A Frenchman can understand about half of a catalog description in English, and can at least copy out names, code words and identifying marks, whereas the Russian works in an alphabet entirely different from ours and finds difficulty in understanding the simplest terms. Those Russians noted for their command of several foreign languages are the few among the wealthy families who have had every advantage of education and travel. The German agents made it a universal practice in Russia, as elsewhere, to learn the language of the country, and having done this it was easy to use the German technical terms for every new idea brought to Russia, so that now it is a safe guess to try the German name for anything mechanical, as the Russian generally uses the same term and spells it in Russian letters.

The German nation is well supplied with commercial agents formerly doing business in Russia and able to

pass as Russian citizens and travel among the Russian population to all parts of the country where Germany has anything to find out. They have penetrated Russia like water absorbed by a sponge, while our Government has held back from consenting to join our allies in counter action. The only possibility of saving Russia as an independent free people is by filling the sponge from the other side and forcing the Germans out. This can be done only by the use of Russian-born or Russian-speaking agents able to deal with Russians in their own language and according to Russian customs. Fortunately the United States is not without such men, comprising export traders, engineers, merchants and skilled workers in many trades. The Allied case can be presented to the Russians in their own language, and catalogs, descriptions and contracts for American-Russian trade can be provided as required.

The news of the day reflects the changing temper of the Russians toward their few self-appointed leaders supporting by machine guns and bayonets their visionary ideals of brotherhood and nonresistance, and indicates that the time for concerted action by the Allies for the commercial rehabilitation of Russia is very near.

Accident and Fire Prevention

By H. P. Heyne
Safety Inspector United Alloy Steel Corporation, Canton, Ohio

Safety education means to assist in the spread of ideas and the achieving of success in accident and fire prevention, together with the correct operation of the work. It keeps each in touch with the other's activities and aspirations, binding all closer together with a proper feeling and interest, and eliminates selfish endeavors.

There are many classes of men in the shops. Among them we find optimists and pessimists. The optimist takes the bright side of the matter, and through his enthusiastic power the dark clouds are cleared away. The pessimist's views are directly opposite. They are "safety slackers," who must be converted to the optimist's side, and when they have seen the light there will be more nearly complete coöperation.

Foremen should not be too ready to visit their irritation upon their employees. Rather should they be considerate but firm, and better results will be obtained. The men will render a greater amount of service when they are approached in a proper manner. A correct and frank interpretation of affairs concerning the work will prove more beneficial than a reprimand.

The hasty censure of employees might result in the men leaving, which would mean the loss of skilled labor so much needed at the present time. The employment of new men increases the accident risk and labor turnover, as new men are more apt to be injured than the older ones, because of their not being familiar with the hazards to be avoided.

Foremen should remember that they have much to do with the employees' opinion of the factory. A great economic loss in industry today is due to high labor turnover and accidents.

Success in accident-prevention work depends largely upon the coöperation between the foremen and the men and his displaying an interest in their welfare without permitting them to become too intimate. They should be led in a reserved manner and made to follow such safe practices as will effect a decrease of accidents and the development of a better organized force.

Safety first is a business extension carried to a higher degree of efficiency by reducing deaths and serious injuries with a corresponding diminution in the cost of compensation.

The duties of the factory police chief might also embrace the work of "fire chief" by arranging for the appointment of a fire-fighting squad in each department. Fire drills should be had once a week by sounding the fire alarm for different locations in the plant so that all may familiarize themselves with the location of fire plugs, hose houses, chemical tanks and extinguishers.

Using an Illuminated Sign

In departments where the work is of such a nature that the men are unable to hear the alarm an illuminated sign may be erected with the names of all departments shown. When the alarm is sounded the different signs would light up, showing the particular department from where the alarm was turned in. A sign of this kind could easily be read by the members in the several departments.

Oil-storage houses might have a steam line so erected that the steam could be turned on from the outside of the building to choke the flames.

Sprinklers should be installed in the various departments to insure safety against fire. Periodical inspections of the sprinkler system should be made to ascertain whether proper air pressure is being maintained in the pipe lines; also inspection of fire plugs, hose and extinguishers, and to make certain that the extinguishers are recharged at regular intervals, dates of charging to be marked on a tag attached to the equipment.

According to an item by Walker S. Buel in the Cleveland *Plain Dealer* recently relative to the fire-prevention congress held in Columbus, Ohio, June 11 to 14, some of the reasons for the congress are that:

America burned up $267,560,740 in 1917. Eighty per cent. of this loss was due to carelessness. The money thus criminally destroyed would have darkened the European skies with airplanes and blasted a clear road to Berlin.

Over $700,000,000 is annually wasted or burned in American kitchens. The foodstuffs thus destroyed would feed starving Europe.

It takes a barrel of flour and other ingredients to make from 250 to 265 loaves of war bread, yet one elevator fire destroyed $3,000,000 in wheat.

The United States each year burns up enough property to pay the interest on three Liberty loans.

Three thousand people are burned to death every year in America, 1000 of them children, many left alone in the houses by their parents.

During one year accidents in Ohio injured 166,000 workers.

Every bushel of wheat wasted, every stock of provisions destroyed, every working man or woman crippled and put out of industrial action is a victory for the Hun.

In order to assist in reducing the nation's fire loss we should all direct our attention to fire prevention as well as accident prevention in the factory, the home and in public.

Women's War Service Costumes

By J. V. Hunter

THE utmost efficiency is essential in every industry at this critical period of America's history. In every manufacturing establishment engaged in different kinds of war service, such as making munition, and where women are replacing the men in these establishments, it is merely consistent with our national progressiveness that the dangerous and loose-fitting garments now worn by women should be discarded for a newer, safer and cleaner design that will protect the wearer from serious injury which might occur from loose clothing catching in machinery.

The garments, the designs of which are shown in the illustrations, may be of interest to employers who have in mind the placing of women in their plants, and they have been found serviceable to those who now use them as a protection against moving parts of machinery and similar obstructions in which a woman's ordinary apparel is apt to be caught.

Four interesting costumes of this kind have been designed by Carson, Pirie, Scott & Co., Chicago, who have placed them with some of the largest metal-manufacturing companies in the West, where they are being worn by their women workers. Among these concerns are such large institutions as the International Harvester Co., the Western Electric Co., etc. Costume No. 1, which in some respects seems to be the most serviceable, is called an "overette." It is very much like the overalls worn by men, except that it has been designed to meet the special requirements of the women. The lines of the garment are fuller than a man's garment, especially across the hips. A special feature is the wide belt band which forms above the belt line a sort of semi-jacket that extends up in the front and also in the back almost up to the shoulders. This semi-jacket not only affords protection to the wearers' waist, but it also keeps the garment from slipping up and from becoming uncomfortable.

Costume No. 2 is in two pieces—coat and trousers—and was designed particularly for outdoor service, and being more bulky it will not be so desirable for general factory purposes.

Costume No. 3 is a serviceable suit for factory work. The design is similar to that of No. 1, but has the added feature of being in effect a complete waist, thus affording absolute protection from dirt. It will also be noticed that it has a deep gaiter above the ankles, which is buttoned snugly, giving the appearance of leggings and making it desirable for women engaged in operating machinery having foot-control levers.

Costume No. 4 is a service suit that will cover up all of the woman's ordinary garments if she cares to use it in that manner.

All of these suits are made of Warren jean material, in khaki color.

PROCUREMENT DIVISION

TENTATIVE PERSONNEL
CORRECTED TO MAY 25th, 1918

STAFF OFFICERS
Lt. Col. C. N. Black
Lt. Col. R. Crews
Lt. Col. R. P. Lamont
Lt. Col. E. C. Warren
Lt. Col. W. Williams
Lt. Col. C. W. Watson

HEAD OF THE PROCUREMENT DIVISION
Colonel Samuel McRoberts
P

EXECUTIVE OFFICER
Major A. W. Fairchild

PL — CONTRACT SECTION
Lt. Col. R. Crews

MAJORS
Low, B. R. C.
Holcombe, A. L.
Hindman, A. C.

CAPTAINS
Abbey, E. N.
Alexander, G. M.
Hawkins, R. H.
Pinanski, A. E.
Schultz, T. S.
Stokes, P. H.
Vogel, E. C.

1st LIEUTENANTS
Corboy, W. J.
England, J. T.
Gault, M.
Groveley, L. O.
Hall, C. R.
Hills, R. W.
Holland, L. P.
Middleton, A.
Richter, F. E.
Willis, S. D.

2nd LIEUTENANTS
Schwartz, L. F., Jr.

PN — CREDITS SECTION
Maj. J. H. Watkins

MAJORS
CAPTAINS
Brown, W. C.

1st LIEUTENANTS
Gould, S. S.
Bomm, F. J.
Brundage, C. F.
Jenkins, T. C.
Meeds, H. S., Jr
Ross, J. M.

2nd LIEUTENANTS
Gwynn, P. P.

PG — GENERAL CONTROL SECTION
CAPT. W. H. ADAMS

MAJORS
CAPTAINS
Babson, W. A.
Caldwell, E. T.
Featherstone, G.
Gibson, E. T.
McCall, L. H.
Levering, E. W.
Raleigh, G. P.
Rooney, F.
Rowland, B. P. M.
Squier, E. E., Jr.
Jones, I. N.

1st LIEUTENANTS
Buckingham, J. R.
Connette, T. W.
Curtis, P. A.
Davidson, H. G.
Griswold, E. C.
Hall, B.
Kerr, T. W.
McKenna, J. H.
Reckefus, S. S.
Williams, S. C.
Holmes, A.

2nd LIEUTENANTS
Champlin, A. D.

PA — ARTILLERY SECTION
Lt. Col. E. S. Hughes

MAJORS
CAPTAINS
Nichols, G. R., Jr.
Bamberger, C.
Gabelein, A. W.
Hampton, H. H.
Harrison, R.
Hood, J. D.
Kerwin, E. M.
Knowlton, G. W., Jr

1st LIEUTENANTS
Anderson, M. P.
Carmichel, D. A.
Newcomb, B. R.
Nevins, T. W.

2nd LIEUTENANTS

PD — LOADING SECTION
Maj. H. Lindsley (Detached Service)

MAJORS
Bumstead, Dale

CAPTAINS
Salisbury, G. N. (Acting Head)

1st LIEUTENANTS
Huntting, G. N.

2nd LIEUTENANTS

PK — MOTOR EQUIPMENT
Maj Guy Hutchinson
(Acting Head)

MAJORS
Carlisle, T W,

CAPTAINS
Alexander, D
Bird, W G.
Davenport, D.
Duntley, L. B.
Taylor, S. G.

1st LIEUTENANTS

2nd LIEUTENANTS

PP — PROJECTILE SECTION
Maj. M. G. Baker

MAJORS
Day, R. D

CAPTAINS
Andrews, A. W.
Brown, A. H.
Cheston, F. C.
Garrett, H S
Gordon, L. S.
Miller, M. C.
Moore, P.
Smith, E. G.

1st LIEUTENANTS
Andrews, F. L.
Congdon, G N.
Grant, E. G
Kennedy, P
Lincoln, S. H.
Miller, W A.
O'Brien, E. P.
Wright, H B.

2nd LIEUTENANTS
Weaver, H. S

PS — SMALL ARMS SECTION
Maj. E. A. Shepherd

MAJORS
CAPTAINS
Baylis, Wm., Jr.
Bump, M. P.
Hebard, A. E.
Johnson, H. B.
Morgan, J.
Plimpton, H. C.
Pomeroy, W. McL.
Robinson, P.

1st LIEUTENANTS
Demeritt, H. S.
Ferrandou, A. H.
Hagans, M. H. P.
Kinard, F.
Lufburrow, R. A.
Shepherd, L. V
Laird, P D

2nd LIEUTENANTS

PV — EXPLOSIVES SECTION
Capt. C. B. Peters

MAJORS
Harkness, L. R. T
Myers, J. H.

CAPTAINS
1st LIEUTENANTS
Areford, E. S.
Moody, E. R.
Wright, E. C.

2nd LIEUTENANTS
Crittenberger, G. D.
Mann, H. E.
Smith, E. D.

PB — PACKING CONTAINER SECTION
Maj. H. J. Welch

MAJORS
CAPTAINS
Goodwille, W S.

1st LIEUTENANTS
Deacon, G. H.
Gunnison, R. N.

2nd LIEUTENANTS
Webb, J. H.

PE — EQUIPMENT SECTION
Maj. H. H. Lehman

MAJORS
Coriell, W. W
Pratt, G. W.
Slosson, M. H.

CAPTAINS
Battey, W R.
Harpham, J
Price, C. B.
Richmond, C. R.
Ordway, W
Young, C. N.
Armstrong, P

1st LIEUTENANTS
Boyle, L V
Dyer, G. H.
Floyd, R. C.
Hussey, G
Shinkle, B
Soper, H. A
Street, H. A

2nd LIEUTENANTS
Goldrick, P. N
Gormley, H. L.
Grant, U. S., IV
Steiner, H. E.
Williams, A. H.

PM — MISCELLANEOUS SECTION
Capt. L. A. Pierrong

MAJORS
CAPTAINS
Carlton, H
Cowehaven, E. A
Cross, H. W.
Morrissey, G E. (Temporary Detail at Balto.)
Fleshoim, R. S.
Oliver, W G.
Pearson, C. H.

1st LIEUTENANTS
Bishop, R. E
Morrison, E. S.
Obershain, H. E.
Pearce, F. D

2nd LIEUTENANTS
Millar, W E

PR — RAW MATERIAL SECTION
Lt. Col. R P. Lamont (Acting Head)

MAJORS
Geisbenen, W. H.

CAPTAINS
Corlies, H.
MacCleary, W. M.
Peebles, N. C.
Phipps, H. C.
Winn, R A.

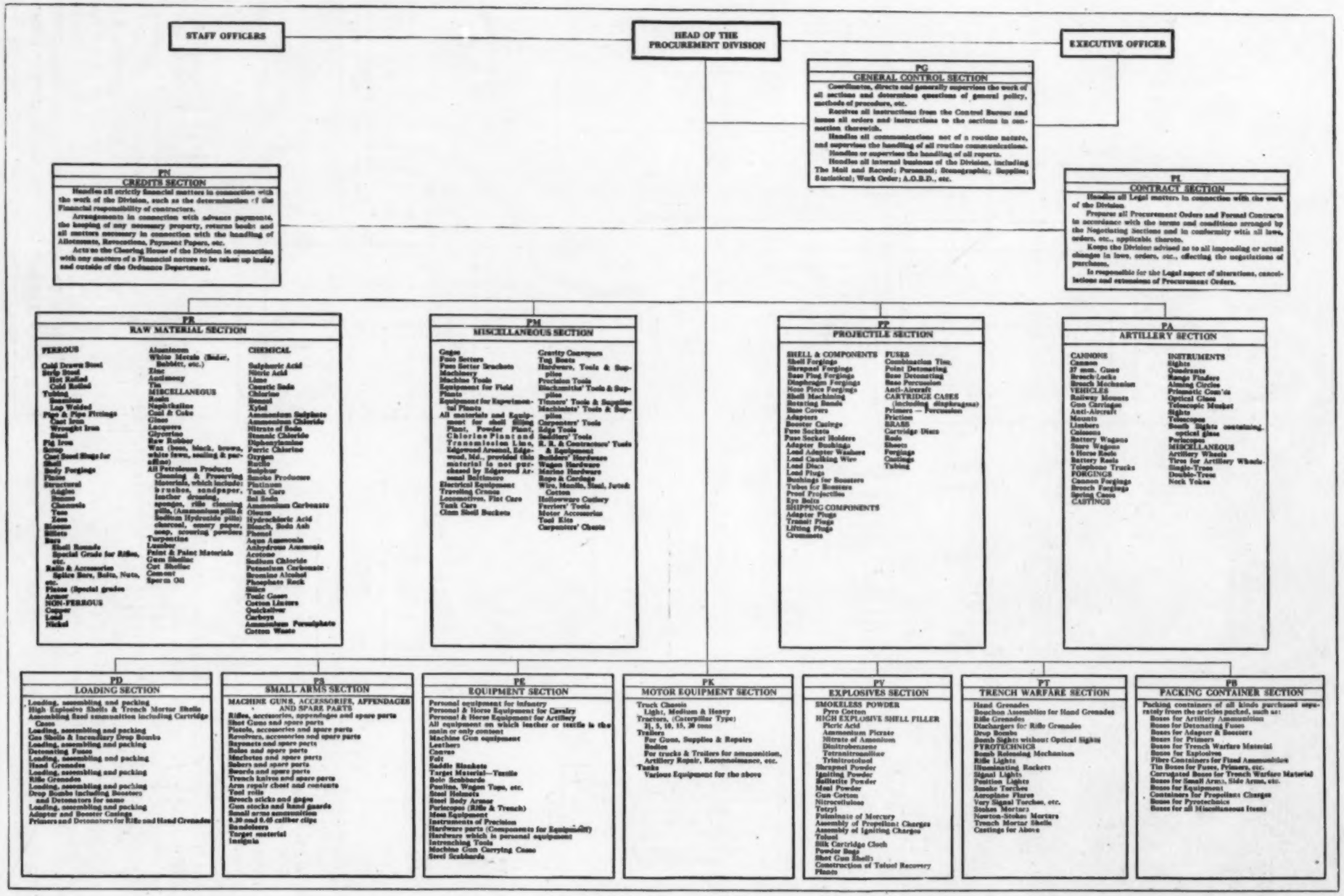
1st LIEUTENANTS
Lally, R. R.
Arnold, D.C.
Baker, A. B.
Barnes, E. M.
Hitt, E. G.
Howell, W E.
Keating, E. F
Vehslage, H. E.
Williams, E. A.
Williams, M. D.

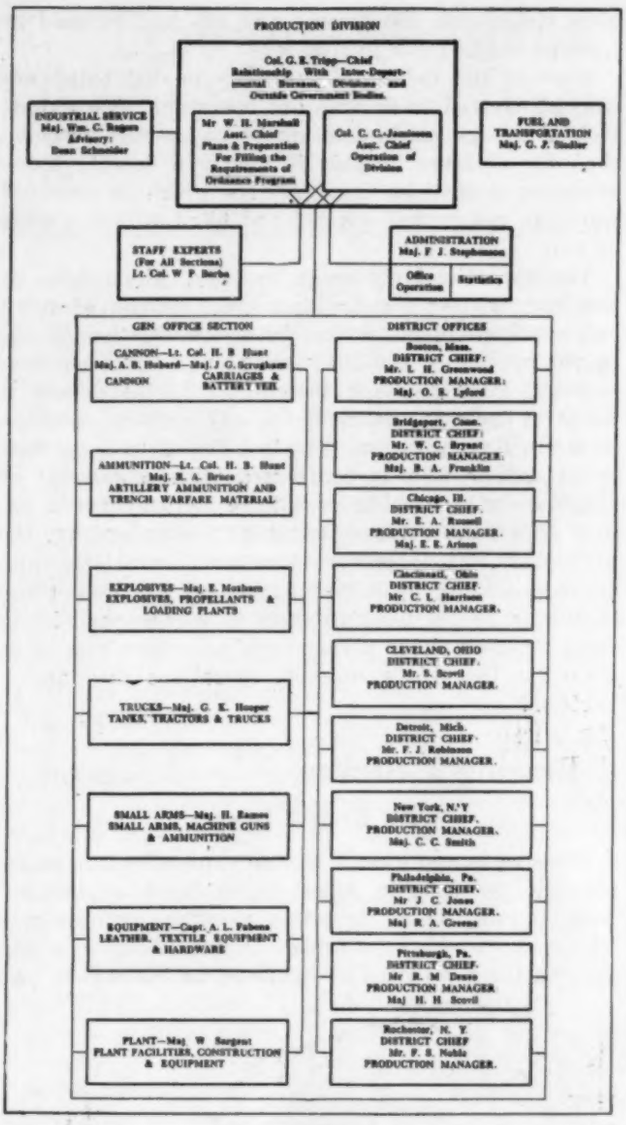
2nd LIEUTENANTS
Dunne, C. B.
Flammer, W H.
Huntley, W B.
Welsh, J K.

PT — TRENCH WARFARE SECTION
Capt. E. L. Wilmer

MAJORS
CAPTAINS
Freeman, R. R
Minton, O.

1st LIEUTENANTS
2nd LIEUTENANTS

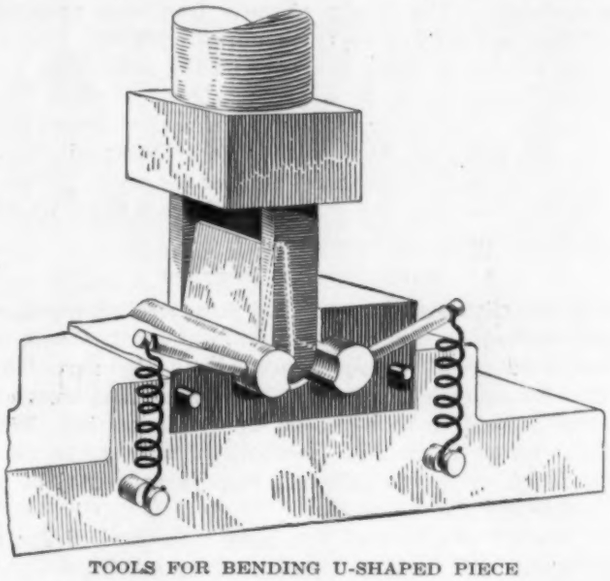

STAFF OFFICERS
HEAD OF THE PROCUREMENT DIVISION
EXECUTIVE OFFICER
PG
GENERAL CONTROL SECTION
Coordinates, directs and generally supervises the work of all sections and determines questions of general policy, methods of procedure, etc.
Receives all instructions from the Control Bureau and issues all orders and instructions to the sections in connection therewith.
Handles all communications not of a routine nature, and supervises the handling of all routine communications.
Handles or supervises the handling of all reports.
Handles all internal business of the Division, including The Mail and Record; Personnel; Stenographic; Supplies; Statistical; Work Order; A.G.B.D., etc.
PN
CREDITS SECTION
Handles all strictly financial matters in connection with the work of the Division, such as the determination of the Financial responsibility of contractors.
Arrangements in connection with advance payments, the keeping of any necessary property, returns books and all matters necessary in connection with the handling of Allotments, Revocations, Payment Papers, etc.
Acts as the Clearing House of the Division in connection with any matters of a Financial nature to be taken up inside and outside of the Ordnance Department.
PL
CONTRACT SECTION
Handles all Legal matters in connection with the work of the Division
Prepares all Procurement Orders and Formal Contracts in accordance with the terms and conditions arranged by the Negotiating Sections and in conformity with all laws, orders, etc., applicable thereto.
Keeps the Division advised as to all impending or actual changes in laws, orders, etc., affecting the negotiations of purchases.
Is responsible for the Legal aspect of alterations, cancellations and extensions of Procurement Orders.
PR
RAW MATERIAL SECTION
FERROUS
Cold Drawn Steel
Strip Steel
Hot Rolled
Cold Rolled
Tubing
Aluminum
Lap Welded
Pipe & Pipe Fittings
Cast Iron
Wrought Iron
Steel
Pig Iron
Scrap
Cast Steel Slugs for Shell
Body Forgings
Plates
Structural
Angles
Beams
Channels
I-Bars
Tees
Zees
Blooms
Billets
Bars
Shell Rounds
Special Grade for Rifles, etc.
Rods & Accessories
Spike Bars, Bolts, Nuts, etc.
Plates (Special grades
Armor)
NON-FERROUS
Copper
Lead
Nickel
Aluminum
White Metals (Babbitt, Babbitt, etc.)
Zinc
Antimony
Tin
MISCELLANEOUS
Rosin
Naphthalene
Coal & Coke
Glues
Lacquers
Glycerine
Raw Rubber
Wax (bees, black, brown, white (wax, sealing & paraffine)
All Petroleum Products
Cleaning & Preserving Materials, which include: brushes, sandpaper, leather dressing, sponges, rifle cleaning pills, (Ammonium pills & Sodium Hydroxide pills) charcoal, emery paper, soap, scouring powders
Turpentine
Linseed
Paint & Paint Materials
Gum Shellac
Cut Shellac
Camauba
Sperm Oil
CHEMICAL
Sulphuric Acid
Nitric Acid
Lime
Caustic Soda
Chlorine
Benzol
Xylol
Ammonium Sulphate
Ammonium Chloride
Nitrate of Soda
Stannic Chloride
Diphenylamine
Ferric Chloride
Oxygen
Barilla
Sulphur
Smoke Producers
Platinum
Tank Cars
Tank Cars
Iso Soda
Ammonium Carbonate
Ozone
Hydrochloric Acid
Bleach, Bicarb Ash
Phenol
Aqua Ammonia
Anhydrous Ammonia
Acetone
Sodium Chloride
Potassium Carbonate
Bromine Alcohol
Phosphate Rock
Silica
Toxic Gases
Cotton Linters
Quicksilver
Carboys
Ammonium Persulphate
Cotton Waste
PM
MISCELLANEOUS SECTION
Cogue
Pass Setters
Pass Setter Brackets
Machinery
Machine Tools
Equipment for Field Plants
Equipment for Experimental Plants
All materials and Equipment for shell filling Plant, Powder Plant, Chlorine Plant and Transmission Line, Edgewood Arsenal, Edgewood, Md., provided this material is not purchased by Edgewood Arsenal Baltimore
Electrical Equipment
Traveling Cranes
Locomotives, Flat Cars
Tank Cars
Glass Shell Buckets
Gravity Conveyors
Tug Boats
Hardware, Tools & Supplies
Precision Tools
Blacksmiths' Tools & Supplies
Tinners' Tools & Supplies
Machinists' Tools & Supplies
Carpenters' Tools
Edge Tools
Saddlers' Tools
R. R. & Contractors' Tools & Equipment
Builders' Hardware
Wagon Hardware
Marine Hardware
Rope & Cordage
Wire, Manila, Steel, Jutes & Cotton
Hollowware Cutlery
Farriers' Tools
Motor Accessories
Tool Kits
Carpenters' Chests
PP
PROJECTILE SECTION
SHELL & COMPONENTS
Shell Forgings
Shrapnel Forgings
Base Plug Forgings
Diaphragm Forgings
Nose Piece Forgings
Shell Machining
Rotating Bands
Base Covers
Adapters
Booster Casings
Pyro Sectors
Fuse Socket Holders
Adapter Bushings
Lead Adapter Washers
Lead Caulking Wire
Lead Discs
Lead Plugs
Bushings for Boosters
Tubes for Boosters
Proof Projectiles
Eye Bolts
SHIPPING COMPONENTS
Adapter Plugs
Transit Plugs
Lifting Plugs
Grommets
FUSES
Combination Time, Point Detonating
Base Detonating
Base Percussion
Anti-Aircraft
CARTRIDGE CASES (including diaphragms)
Primers — Percussion
Friction
BRASS
Cartridge Discs
Rods
Sheets
Forgings
Castings
Tubing
PA
ARTILLERY SECTION
CANNONS
Cannon
37 mm. Guns
Breech Locks
Breech Mechanism
VEHICLES
Railway Mounts
Gun Carriages
Anti-Aircraft
Mounts
Limbers
Caissons
Battery Wagons
Store Wagons
6 Horse Reels
Battery Reels
Telephone Trucks
FORGINGS
Cannon Forgings
Breech Forgings
Spring Cases
CASTINGS
INSTRUMENTS
Sights
Quadrants
Range Finders
Aiming Circles
Prismatic Com'ds
Optical Glass
Telescopic Musket Sights
Telescopes
Sight Sights containing optical glass
Periscopes
MISCELLANEOUS
Artillery Wheels
Tires for Artillery Wheels
Single-Trees
Double-Trees
Neck Yokes
PD
LOADING SECTION
Loading, assembling and packing
High Explosive Shells & Trench Mortar Shells
Assembling fixed ammunition including Cartridge Cases
Loading, assembling and packing
Gas Shells & Incendiary Drop Bombs
Loading, assembling and packing
Detonating Fuses
Loading, assembling and packing
Hand Grenades
Loading, assembling and packing
Rifle Grenades
Loading, assembling and packing
Drop Bombs including Boosters and Detonators for same
Loading, assembling and packing
Adapter and Booster Casings
Primers and Detonators for Rifle and Hand Grenades
PS
SMALL ARMS SECTION
MACHINE GUNS, ACCESSORIES, APPENDAGES AND SPARE PARTS
Rifles, accessories, appendages and spare parts
Shot Guns and spare parts
Pistols, accessories and spare parts
Revolvers, accessories and spare parts
Bayonets and spare parts
Bolos and spare parts
Machetes and spare parts
Sabers and spare parts
Swords and spare parts
Trench knives and spare parts
Arm repair chest and contents
Tool rolls
Breech sticks and gages
Gun stocks and hand guards
Small arms ammunition
0.30 and 0.45 caliber clips
Bandoleers
Target material
Insignia
PE
EQUIPMENT SECTION
Personal equipment for infantry
Personal & Horse Equipment for Cavalry
Personal & Horse Equipment for Artillery
All equipment on which leather or textile is the main or only content
Machine Gun equipment
Leathers
Canvas
Felt
Saddle Blankets
Target Material—Textile
Bolo Scabbards
Poncho, Wagon Tops, etc.
Steel Helmets
Steel Body Armor
Periscopes (Rifle & Trench)
Mess Equipment
Instruments of Precision
Hardware parts (Components for Equipment)
Hardware which is personal equipment
Intrenching Tools
Machine Gun Carrying Cases
Steel Scabbards
PK
MOTOR EQUIPMENT SECTION
Truck Chassis
Light, Medium & Heavy
Tractors, (Caterpillar Type)
3½, 5, 10, 15, 20 tons
Trailers
For Guns, Supplies & Repairs
Bodies
For trucks & Trailers for ammunition, Artillery Repair, Reconnoissance, etc.
Tanks
Various Equipment for the above
PV
EXPLOSIVES SECTION
SMOKELESS POWDER
Pyro Cotton
HIGH EXPLOSIVE SHELL FILLER
Picric Acid
Ammonium Picrate
Nitrate of Ammonium
Dinitrobenzene
Tetranitroaniline
Trinitrotoluol
Shrapnel Powder
Igniting Powder
Ballistite Powder
Mine Powder
Gun Cotton
Nitrocellulose
Tetryl
Fulminate of Mercury
Assembly of Propelling Charges
Assembly of Igniting Charges
Toluol
Silk Cartridge Cloth
Powder Bags
Shot Gun Shell:
Construction of Toluol Recovery Plants
PT
TRENCH WARFARE SECTION
Hand Grenades
Bouchon Assemblies for Hand Grenades
Rifle Grenades
Dischargers for Rifle Grenades
Drop Bombs
Bomb Sights without Optical Sights
PYROTECHNICS
Bomb Releasing Mechanism
Rifle Lights
Illuminating Rockets
Signal Lights
Position Lights
Smoke Torches
Aeroplane Flares
Very Signal Torches, etc.
Stokes Mortars
Newton-Stokes Mortars
Trench Mortar Shells
Castings for Above
PB
PACKING CONTAINER SECTION
Packing containers of all kinds purchased separately from the articles packed, such as:
Boxes for Artillery Ammunition
Boxes for Detonating Fuses
Boxes for Adapter & Boosters
Boxes for Primers
Boxes for Trench Warfare Material
Boxes for Explosives
Fibre Containers for Fixed Ammunition
Tin Boxes for Fuses, Primers, etc.
Corrugated Boxes for Trench Warfare Material
Boxes for Small Arms, Side Arms, etc.
Boxes for Equipment
Containers for Propellant Charges
Boxes for Pyrotechnics
Boxes for all Miscellaneous Items



Press Tools for Bending Spring Stock

BY EARL C. WILLIAMS

Having a clip to make from $\frac{1}{16}$ stock which had a high percentage of carbon and finding the usual form of bending die unsuitable for the reason that it would not form the piece and hold the sides parallel I overcame



TOOLS FOR BENDING U-SHAPED PIECE

the difficulty in the manner shown in the illustration. The radius on the punch and die should be made smaller than that required, to allow for the inevitable return or springing out of the metal after leaving the die. The spring-operated rolls are shaped in such manner as to close the form around the punch an amount sufficient to compensate for this return. The rolls should never be placed above center, as this will cause them to bind. This is a simple die to make and operate. The same design may also be used in forming pieces that might otherwise require a compound die.

The Endless Shifting of Industrial Workers

SPECIAL CORRESPONDENCE

The time has come when influences must be brought to bear, outside of the individual shops, to reduce the present-day labor turnover. Some industrial managers are exhausting every means to keep their workers constantly on the job and contented. However, as long as the practice of creating dissatisfaction in neighboring shops to gain their workmen continues, nothing can be accomplished in the real constructive work of building up a shop organization to the highest efficiency.

THERE are few of our industrial managers who would not become indignant if accused of robbing a fellow plant owner of $50, or who would not go out of his way to return the money if they should find it their anteroom. Yet when some other shop's skilled employee looking for a job because he does not know whether he is satisfied with the one he has or not comes strolling into his employment office our righteous and virtuous manager can see nothing wrong in trying to make him dissatisfied in order to obtain his services. Nevertheless, in so doing he is robbing his fellow shop owner of the money that has been invested in the man's training; and he knows that he also must invest a like amount before the workman will be a capable producer in his plant.

In some cities where the pressure of manufacturing munitions has made itself felt to the greatest degree, this system of hiring a neighbor's workmen is carried to such extremes that the men themselves have lost their stability and have become chronic job hunters. No matter how well they may be treated or paid in one place, in a few days they are out again hunting for "something better."

Much thought has been given to and advice rendered about training employment experts to select employees so that labor turnover will be lessened, but now some-

thing should be said to managers about the wrong of taking men away from others.

One city in the Middle West which may be used as an example is already well supplied with war orders, but if every man in the industrial establishments of this city was steadily employed in his own place and trained to produce to his utmost ability, more work could be undertaken. The luring of men from one shop to another has created so much unrest, however, that a large number of them is always on the move, thus reducing productivity to a great extent. Perhaps the cost-plus munition makers are primarily responsible for this condition, because they never bothered about the cost so long as they could produce the work. At any rate this has been the complaint of every town where these industries are located.

Managers Get Together

In the city alluded to the plant managers got together and agreed to stop advertising for help, but only a few lived up to the agreement. They also agreed to stop hiring each other's help, a promise that most of them seemed to have evaded by either ceasing their inquiries as to whether the applicant was at the time employed, or by the following manner as related by a draftsman:

"I went into So and So's place and inquired for a position that I knew was vacant. They asked the usual questions as to my experience, fitness and salary. After I had satisfied them they asked if I was employed, and I told them I was, giving them the name of my employer. 'We have an agreement not to hire men from them,' the manager responded, 'but if you should be out of a job tomorrow and come around here I think I will be able to place you.' "

What is true of one city is true in measure of all the others. Owing to the increased cost of living, labor is little better off, so far as the returns to be obtained from their wages are concerned, than it was before the advance in wages began, though no one suffers today except those on a small fixed salary or those on a pension, and in spite of the advances few find themselves more favorably situated. When manufacturers continually advance the wage scale to obtain labor they store up trouble for themselves in the future. Wages in most of our industries today seem to be nearly adequate, considering the various classes of labor involved, and the demand now is that the reputable manufacturers in every community should combine to protect themselves against their unscrupulous competitors who are ruining productive systems by disrupting well-organized industrial forces.

The reply of the unprincipled man will be that he is engaged in important Government work, and further he will ask, if he requires skilled or semiskilled labor, how otherwise is he to get it? The answer to that is simply: "Train it yourself. The industries from whom you are stealing are engaged in just as important work for the Government as yours."

Among those who have suffered greatly from the bidding-up of wages are the machine-tool builders, whose workers are vitally necessary to the productive effort of the mechanical industry of the nation for carrying on the war. Skilled labor is as truly a part of the capital of a plant as is the machine equipment. What more right, then, has anyone who has had no hand in training skilled labor to steal it?

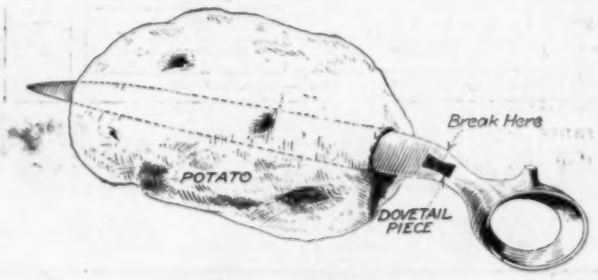
Most of the industrial operators needed today are workers trained to do only one operation. Yet skilled toolmakers and machinists are being tempted away by the offer of large bonuses if they will operate screw machines or shell lathes, a task for which an unskilled workman can be well trained and fitted within a week or two.

The appenticeship-training systems, which have of late been written about with a great amount of detail and explanation, prove that better results can be obtained by taking unskilled labor or labor from nonessential industries and training it in the details it needs to know to qualify it for any required machine or assembling operation. The task therefore is for each manufacturer who is confronted with a scarcity of single-operation mechanics to have his employment expert search the nonessential industries and gather the bricklayers, plasterers, pianomakers, carpenters and the like—all intelligent, trained men, who at present find it difficult to get work in their industries—and bring them together under proper training supervision to fit them for the simple machine operations they are to perform.

Brazing a Broken Pair of Scissors

By George Blake

Some years ago when I was an apprentice in a small, old-fashioned shop in Aberdeen, Scotland, a novel repair job came under my notice, namely, brazing a pair of scissors which were broken in one of the legs just back of the pivot hole, as indicated on the sketch. As



NOVEL USE FOR A POTATO

the break happened to be a clean one the following method was used to join the two pieces: A small dovetail was cut at each end of the broken parts, a piece was fitted to the dovetails and lightly tapped in with a small hammer to keep the parts in position while the brazing was done. To keep the temper from being drawn from the cutting edge during the brazing operation I was sent out to a near-by café for a potato into which the fitter stuck the scissors' leg, the potato practically covering the cutting part thereof, and just leaving the part which was to be brazed sufficiently clear to allow the flame to be used. The operation was entirely successful and the scissors practically as sound as when new. The potato being moist served to keep the scissors' leg cool during the brazing.

Needless to say I have never forgotten the somewhat unusual method and have since then employed the idea for similar jobs.

Training Mechanics for Service in Army Field Units

By J. V. HUNTER
Western Editor *American Machinist*

Certain branches of the army service have already recognized the need of skilled mechanics for their construction and repair work and are accordingly training them. These are taken from among the drafted men that are now available. Some of the technical schools of the country have undertaken training work of this kind for the Government, and the results which they are obtaining are remarkable. Mechanics of a fair grade of skill are produced in the short period of eight weeks. The methods employed will be of interest to manufacturers who are finding it increasingly difficult to obtain mechanics.

SOME months ago need was felt of providing units of skilled mechanics for the army who might be sent into the field with the troops to take care of emergency-repair work; also of providing skilled workers as a part of the service attached to base repair shops that may be established on the other side. Owing to the demand which our mechanical trades are already making on skilled labor, the best policy seems to be to recruit the needed men from among those within the draft age. Poor judgment was used by many of the draft boards when classifying the registrants, and it was to offset the mistakes of the selective draft and insure a knowledge of the mechanical trades to those who were allotted to repair work that these training schools were established. Moreover, it was very desirable that the men should receive a certain amount of vocational training in order to judge of their fitness for the different grades of work in which they might be employed in the future. Numerous vocational schools and engineering colleges in the past have specialized in training mechanics in wood and metal work, and many of these schools volunteered their services for this training work. Such methods as they are employing, while by no means uniform at the start, are rapidly developing into thorough training systems, and a description of some of them may be of interest to those engaged in industrial plants and also to employment managers in these concerns. The latter are beginning to realize that hiring a fellow-competitor's skilled employees cannot go on forever, and the time has come when every shop must undertake the training of young men, old men and even women who have had no previous shop training, so that they may be used in the mechanical trades.

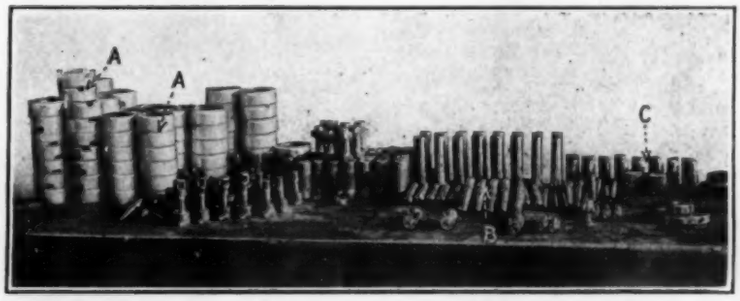


FIG. 1. WORK OF MEN AT THE UNIVERSITY OF CHICAGO

The work of schools under Government supervision is broader than the mere machine-tool shop and trade, and many of them are training men for every branch of service employment. The classes include machine-shop, tool work, forge practice, acetylene welding, rough and high-grade wood-working and repairing of automobile, engine and running-gear units. Special units are also being organized to train watch and clock makers in repairing high-grade aeronautical and naval-station instruments.

These schools have arranged to give an eight-week intensive-training course to each unit sent for instruction. The facilities of the various school shops will accommodate units ranging from 100 to 300 men per school. These men are ordered out direct from their homes by their draft boards, and possess no military training. Commissioned officers are furnished from the training camps, and are in charge outside of the hours spent in the school shops, and give the necessary training in military drill and discipline. Inside the shops the regular corps of vocational instructors are responsible for the care of the men unless too flagrant violations of discipline arise. The failure of the selective-draft boards to furnish men of the required experience and training in the mechanical trades to the schools has not dampened the enthusiasm nor discouraged the instructors engaged in this work. The average class of men furnished is shown by the table. Exceptionally high-grade mechanical work is required on all materials furnished to the Government and close limits are specified. The shop manager must pick and train his already skilled mechanics to work to these limits. For these reasons doubt will arise as to the possibility of ever training such miscellaneous human material into serviceable mechanics. The instructors engaged in this work, however, have gone with enthusiasm into the task of overcoming such a handicap.

PREVIOUS TRAINING OF STUDENT RECRUITS

	Per Cent.
Clerks	33
Salesmen	25
Auto repairers	11
Machinists	8
Chauffeurs	6
Draughtsmen	6
Engineers	3
Electricians	2
Chemists	2
Lawyers	2
Undertakers	1
Students	1

Fortunately the average education of the majority is rather high, since more than half have better than an eighth-grade education, the grading running as fol-

lows: One less than eighth grade; 33, eighth grade; 9, one-year high school; 16, two years; 4, three years; 11 four years; 5, one year in college; 6, two years; 7, three years; 5, four years, and 3 with a master's degree.

A further investigation of the manual-trade training of this same group of men shows the following: Previous technical training in correspondence school, 4; evening school, 6; technical course in engineering schools, 11; apprenticeship training, 13; technical course in high school, 14; manual training in grades, 14; incidental training, 16; no previous technical training, 22.

Those accustomed to think that only high-grade mechanics should be furnished to a shop department when men are required will be surprised at the results accomplished by these training schools in developing fairly well skilled mechanics in so short a time. It appears that shops for the past generation have worked entirely on the wrong theory in training their mechanics, and one reason we have not an unlimited number of mechanics today is primarily due to lack of ability, willingness or opportunity of the present-day shop foreman to train and school raw material to do ordinary shop work.

Wide association with foremen indicates that the first two points are the true faults, for most foremen have many opportunities for careful and thoughtful instruction, which, however, they often devote to abusing a workman for spoiling a piece of material. Today our vocational instructors are showing by their tact and ability that better results can be obtained from men who have had no shop work than from those of lesser quickness of thought whose primary ability has been dwarfed and stunted by long shop associations.

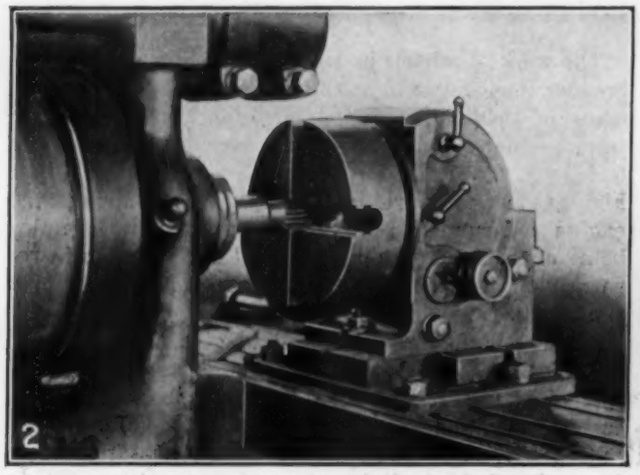


FIG. 2. TRAINING WORK ON THE MILLING MACHINE

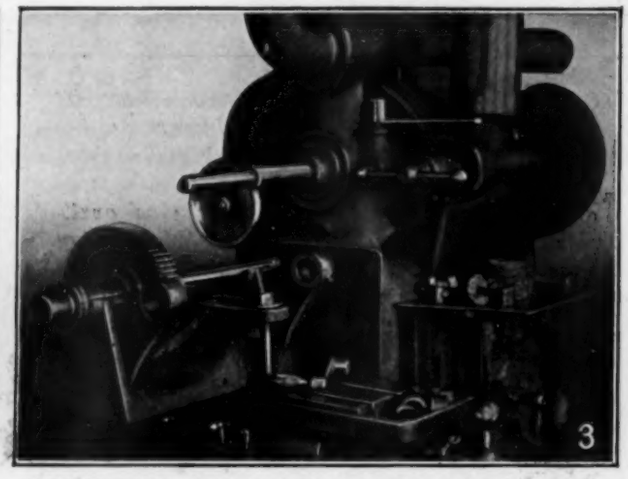


FIG. 3. LATHE HEADSTOCK WORK, LEWIS INSTITUTE

The educational courses now planned in these schools are typified by two main systems, one to create specialists on certain machine tools or other mechanical work and the other to create general all-around mechanics with the ability to go out on all sorts of "out-of-order" jobs and put a machine into working condition.

Taking as an example one of the schools which is training men under specialized course methods, some idea of the class of work done in the machine shop may be gained from the illustration shown in Fig. 1. This work is all done under a plan by which the rough parts are supplied by a neighboring manufacturer, who stands all loss due to defective work, but thus gets his machine work done without cost. This method gives the men in training the encouraging idea that the work that they are doing really counts for something instead of being wasted energy, as occurs in training schools that work on plain study exercises. Another gain is the possibility of keeping a man on one operation, such, for instance, as thread cutting, until he has mastered the work and

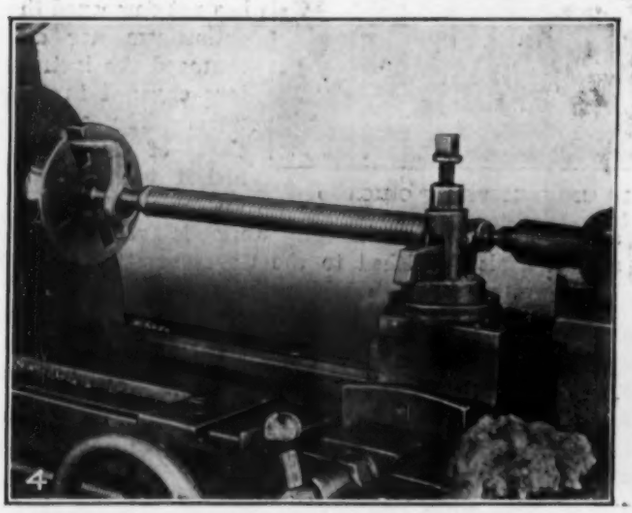


FIG. 4. TURNING SQUARE-THREAD LEAD SCREW

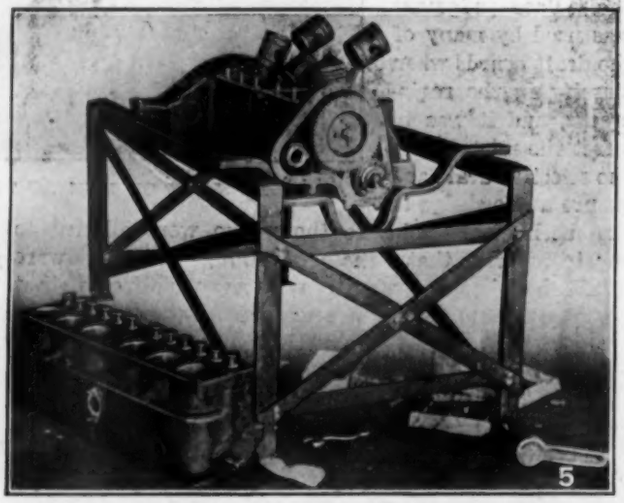


FIG. 5. REBUILDING GASOLINE MOTORS IN SHOP

can be sure of obtaining a good piece of work when put at it in the future.

At *A* are a number of aluminum rings which have an internal thread and are used as locknuts. Aluminum in itself is a difficult material in which to cut a nice thread, but the men have shown remarkable skill and ability to learn to handle this work.

This school shop starts all its men as they enter training on the lathes. According to the degree of adaptability they show in learning to handle this machine tool they earn their own advancement. Some remain on the lathes as specialists in this one tool; others are advanced to the shaping or planing machines. Men showing the highest degree of intelligence in their work may go to the milling machine, where they will be employed on different phases of toolmaking. An example of this work is the milling of the jaw grooves in the lathe chuck shown on the milling machine in Fig. 2.

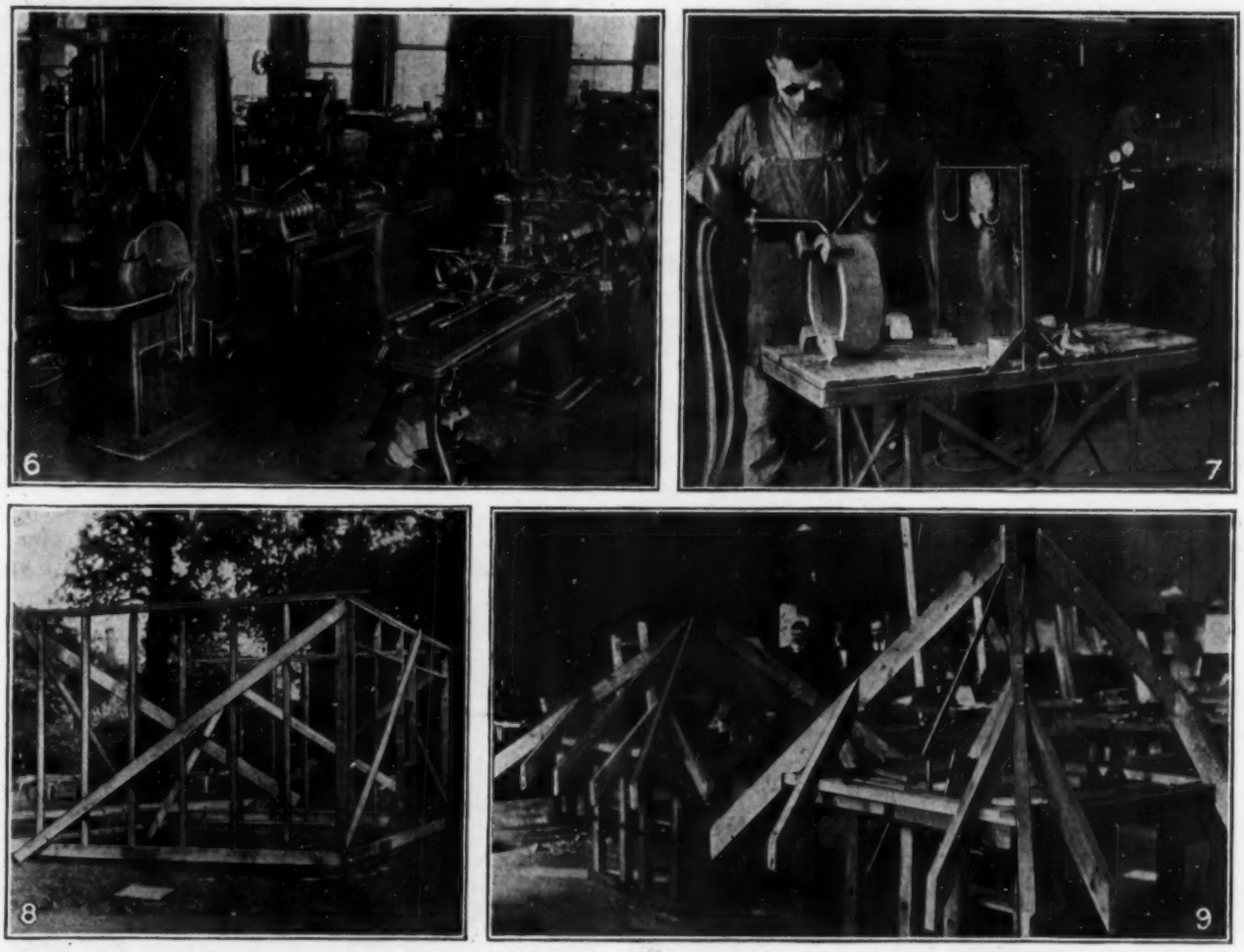
In one group were several relatively high-grade toolmakers. These, however, had served long and careful machine-shop apprenticeship. Several others showing ability in tool work were men who had received no previous machine-shop training before the time they entered this school.

An examination of the output in Fig. 1 shows at *B* some of the pieces which constitute the first lathe work. This is a standard vocational-training exercise and is the only piece of this type that the men turn; it has a threaded, a knurled, and other sections that may be noted. All of these exercises are laid out in accordance with the outline given in what is known as Bulletin No. 8 of the Vocational Training Board, and the schools have endeavored as far as possible to incorporate in the parts upon which the men are working those exercises which have been outlined in this bulletin.

When the workman advances to the point of the internally threaded aluminum ring he is required to produce 10 of these. This gives him greater confidence in handling such difficult work. At the same time he is required to keep track of the time necessary for each successive piece, so the speed of production gradually increases as he attains greater proficiency.

One of the main differences shows up at this point between the training schools and the ordinary manufacturing shop. In the latter when a man is hired to run a lathe and fails to make good, our average "boss" soon fires him; but firing is not the way with the army. A man simply has to make good at some line of work. When a man fails to progress at one point in the training course he is put on a lower grade of work. Men who utterly fail as mechanics, possibly one out of a hundred, are turned over to one of the training camps for induction into the infantry or similar service.

The few men at this school who fail to qualify on



FIGS. 6 TO 9. VIEWS FROM THE LEWIS INSTITUTE AND THE UNIVERSITY OF CHICAGO
Fig. 6—General view of machine shop of the Lewis Institute. Fig. 7—Student in acetylene-welding course at the Lewis Institute. Fig. 8—Erecting full-size building frame, University of Chicago. Fig. 9—Roof frameworks built in shop course, University of Chicago

the lathe are put on drilling-machine work. At first they are given the simplest kind of repetitive drilling and later more difficult set-ups requiring the use of squares, surface gages and other tools.

A large percentage of the men show remarkable ability in acquiring the necessary knowledge to properly handle their machines. Many are engaged in making new parts of equipment, such as the lathe chuck mentioned. Others take portions of the equipment apart to give it a thorough overhauling, scrape bearings and make such repairs as may be necessary, including new gears, etc. Some of the gears made for lathe work are shown at *C*, Fig. 1.

In Fig. 3 is shown the headstock of a lathe which has been taken down and put on the milling machine for reboring some of the bearings. Some of the high-grade lathe work is shown in the long, square-thread lead screw in the lathe in Fig. 4. Old machines of all types are sought out by the instructors and overhauled by one set after another of these embryo mechanics. In Fig. 5 is shown a Hudson six-cylinder automobile motor, which one group has been giving a thorough overhauling. New pistons, rings, etc., are made and even the castings for these repairs are often made in the school's own foundry.

The extent of the equipment found in the training shops of one of these schools may be judged from the partial view of one of the machine shops of Lewis Institute shown in Fig. 6. Practically every type of machine tool found in the modern machine shop is found here in one or more units. These tools are all up to date and practically all are driven by individual motors.

Men engaged in training for general repair work are not limited to machine-shop practice. Several hours each day are devoted to the forge shop where they have a short lecture and a demonstration of the manner of making a particular forging demonstrated to them. They are then sent to their individual fires to produce the work themselves. Such training should be of great service for emergency repairs in the field.

Another additional course given at one of the schools devotes an hour a day to work with the acetylene torch, training the men to make such miscellaneous welds as they might be called on to do in the repair of broken parts. This welding work not only includes experience with steel parts, but also with making welds on brass or other castings, as shown in Fig. 7.

The greatest endeavor has been used by nearly all the instructors to adapt their methods to practical methods. This should be true in any training course, whether given in a factory or for military purposes. Men are naturally more careful and thoughtful in their work when they expect the part to serve a useful purpose. Possibly from the viewpoint of personal interest the automobile training courses have been particularly attractive to the men, and many have applied for training in this line of work. The schools have been equipped with many old automobile parts and engines so that the men may be given full instruction in taking them apart, making the necessary repairs and reassembling. Particular attention has been given to obtaining old auto trucks, as these will predominate in army service. In addition to the old machines many friends have often voluntarily brought in their automobiles to be experi-

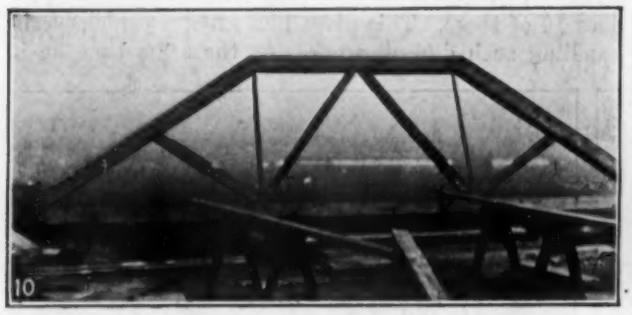


FIG. 10. LARGE ROOF OR BRIDGE TRUSS

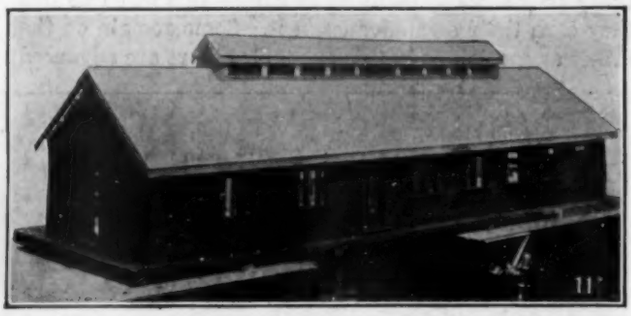
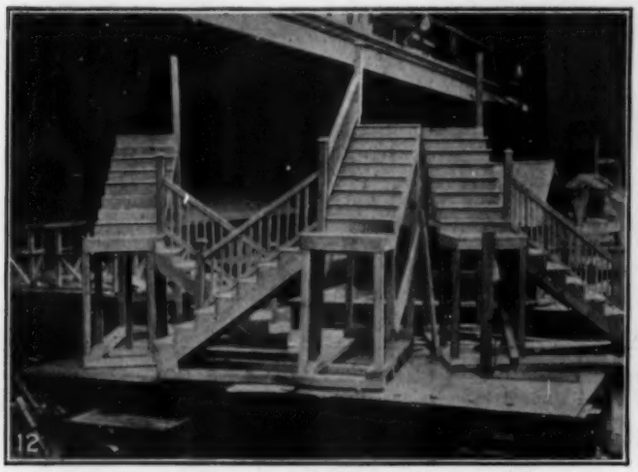
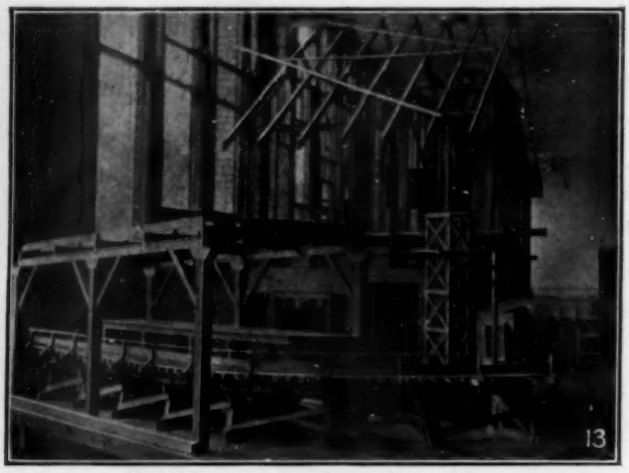


FIG. 11. MODEL BUILDING OF ARMY BARRACKS





FIGS. 12 AND 13. MODEL STAIRWAY BUILDING AND MODELS OF RAILROAD TRESTLE AND CONCRETE FORM WORK AT THE CARTER H. HARRISON TECHNICAL HIGH SCHOOL, CHICAGO

mented on and run any risk that might be occasioned from overhauling by the students. However, with unlimited time on their hands they are careful not to send the machine out until it has been put in thorough repair, even though it may take several days.

The same practical methods are applied to the men in training for wood-working or carpenter service. None of the schools give more than two or three elementary bench-work exercises; only sufficient to insure that each man has a knowledge of the purposes of his various tools. From this point on the work assumes a more practical aspect.

Methods of Instructions

Different schools, however, carry out the practical work by widely varying methods of instruction. Some specialize more in the lighter forms, such as the manufacture of tables, toolboxes and similar pieces. Others go into building-construction work and erect garages and similar structures, most of which are immediately torn down to use again the lumber for the next group, but affording the men excellent training in framing and building construction. The framework of such a building in course of erection is shown in Fig. 8. This school has specialized in full-sized building construction and all the men are working with full-sized lumber so far as it has been possible to follow out this policy. Even when the men are held in the shops by rainy days, full-sized construction work is carried on, as can be seen from the roof framing pieces shown on the benches in Fig. 9. For heavier framing experience roof trusses and bridge trusses, such as those in Fig. 10, are produced, and these are built of even larger sizes, the men later fitting them with roof purlins in order to learn those necessary details.

One of the schools visited has followed out an entirely different principle in training the men for carpenter work, its method being limited to modeling buildings in sizes below full-sized scale. Much of this below-scale work has been done as small as 1 in. to the foot. An example of this is shown in Fig. 11, which represents a standard army barracks. This model is about 24 in. from floor to eaves.

Other models which have been built in this shop by men in training are the stairways shown in Fig. 12 and the miscellaneous models shown in Fig. 13. The latter illustration shows a curved railroad trestle in the foreground and a model house built to one-quarter scale in the background. At the right-hand side may be seen some miscellaneous form-work construction which has been devised to give the men some training in building concrete form work. This work shows them how to obtain the right sizes of columns and beams for concrete construction.

It is questionable, however, whether this experience in building these small models will be of material benefit to the men when they are sent out into the field. Work which may be cut out with a chisel or a pocketknife might leave a man entirely at a loss when he came to constructing work that had to be shaped up by a two-man cross-cut saw and a heavy ax. Also the problem of fastening pieces together with glue and a few brads is a far different matter from properly spiking similar full-sized pieces together in the field in order to have them sustain troops and gun carriages.

Accompanying both the machine-shop and wood-working courses, training is given in elementary drawing. Some of the men are given time for this instruction during the shop periods, but oftener the men are given small parts to take to their barracks and there they make up the drawings which they turn in at their next class. Without doubt this drawing exercise aids them by giving them a better conception of correctly reading the drawings and many of the men have been making very acceptable drawings. A great aid to their training in this line are the men who in their civilian life were engaged in drafting work, who during the barrack hours aid their companions of lesser knowledge. The barrack associations are good for many on that account, as they can thus acquire useful knowledge which might otherwise come very slowly. The plans are to make all the men sufficiently versatile in drawing so that they may go out in the field when necessary and make a sketch of broken parts to take back to the shop with them for repair work. The sketches are usually those made simply with the aid of a straightedge, as this is much faster work than attempting to draw to scale, but the men are given full instructions as to how to properly dimension their work.

The first unit which has recently finished its course has undoubtedly furnished a large number of men who will be useful not only during their army life but later, after the war, in civilian work, and the energy and thought of the instructors who have been engaged in this training is much to be commended.

Criticism of and by a Patternmaker

By M. E. Duggan

In a letter on page 382, Vol. 48, of the *American Machinist* Mr. Derby expresses a doubt as to the practicability of the method suggested by me on page 636, Vol. 47, of making a herring-bone grate pattern and offered his solution, which reminds me of a dialog between our foreman and an applicant for a job as patternmaker:

"Have you a good supply of tools?" asked the boss. "Yes," replied the applicant, "I have two large chests filled with tools of all kinds." "I don't want you," said the boss, "it would take so much of your time to look after your tools that you wouldn't have time to make any patterns."

Special tools and jigs for the construction of patterns are usually unnecessary, though unfortunately many apprentices are instructed to work in this way instead of being taught to use the band-saw whenever possible and thus save the special work.

On page 560, Vol. 47, I described my method of molding manhole frames and crosses, and on page 313, Vol. 48, Mr. Hunter gives the scheme a black eye because he says it would not be "free from the danger of rocking and accident." His objection may be a good one and along practical lines, nevertheless hundreds of such covers and frames have been cast in this manner at our place and have given no trouble whatever.

My object in writing on this matter is to call attention to the simpler way of accomplishing good enough results and saving expensive pattern work and extra care and trouble in the foundry.

One page 927, Vol. 48, George Compo states that "he

cannot agree with me on all points in the construction of match-plate patterns." For one thing he states that "the responsibility of obtaining a well-made pattern rests upon the foreman," in which view I do not concur. I believe the quality of the pattern is up to the patternmaker and the responsibility of selecting the right man for the job rests with the foreman. The making of these match plates is a specialty that not every patternmaker understands, and the foreman should exercise great care in picking a man who is capable of doing the work.

Mr. Compo does not approve of my method of locating the half patterns on the plate, but perhaps he does not fully understand it. As I stated in the letter previously referred to a thin and pointed knife is used for cutting the paper and the latter need not touch the pattern at more than three or four narrow points. We have used this method on hundreds of patterns from which many tons of castings have been produced without experiencing any trouble from faulty registration.

Mr. Compo illustrates very nicely his manner of matching turned patterns, but comparatively few patterns are turned. What does he do when they are of irregular outline?

Binding the edges of wooden match plates with half-round iron is excellent, as is also the practice of having special racks for storing this class of patterns, but unfortunately this condition is likely to prevail only in large foundries, while it is with the little jobbing establishment that the kinks and short cuts about which we have been writing are most important. These little foundries rarely have adequate facilities for handling and storing patterns, and therefore when sending a match plate to such a place I make a light and strong box to hold it and thereby avoid most of the complaints about short-lived patterns.

There are no cut-and-dried rules that must be followed in the making of patterns; drawings seldom give special instructions to the patternmaker in this respect. Rather must he be guided by his experience and by the experience of other practical men as recorded from time to time in the columns of the technical journals. He will find these records both entertaining and instructive if he will take the trouble to read between the lines, pick out the good points and trace their application to his own work.

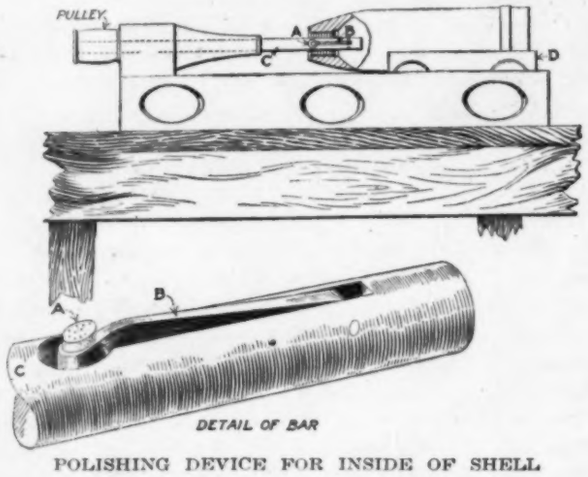
Polishing Inside Profile of Nose on High-Explosive Shells

By H. A. Wilson

The interior walls of a high-explosive shell have to be practically given a glass-smooth finish, otherwise the shell would not function properly. When the shell is fired the rifling of the gun sets up almost instantly a rotative movement of high velocity in the projectile. Owing to the inertia of the charge the rotative movement of the shell is not immediately transmitted to it; hence any roughness would cause heat to be generated which would ignite the explosive before the projectile left the gun and would result in the total destruction of the gun and artillerymen.

The shell forging comes to the manufacturer in the form of a hollow cylinder with one blank end and is rough turned and finish bored with parallel walls. The nosing operation is accomplished by heating the shell nose and partially closing the open end in a hydraulic press fitted with a suitable die. This forging operation is not perfect, but the dies and previous machine operations have been so calculated as to leave enough metal in the nose to machine the shell mechanically correct, which of course demands that all portions of the shell be concentric with the longitudinal axis within a few thousandths of an inch.

It is very advantageous to adjust the weight of the shell at this stage, and for this purpose a special solid form tool gives the best results when mounted on a specially formed boring bar of maximum allowable cross-section to insure rigidity. The bar is fitted in a



POLISHING DEVICE FOR INSIDE OF SHELL

rigid fixture which is moved transversely by means of a hand-operated cross-feed on the saddle. All shells are finish bored in the nose (but not threaded) and finish turned, and are carefully weighed before being passed on to this operation. Each shell has its weight marked on it so that the operator knows how much metal must be removed to bring it within the weight limits necessary to allow it to pass inspection.

This method produces excellent results except that the work shows the tool marks; to remove them and leave a smooth surface the polishing device shown in the illustration was built.

The abrasive is a small, round alundum stone ¾ in. in diameter by 1¼ in. long. One end of the stone is rounded to approximate the general curve of the work. The stone, shown at *A*, is clamped in the small bar *B* which is fitted in a slot in the spindle *C*. The spindle is revolved at about 2000 r.p.m., causing the stone to be pressed against the interior wall of the shell by centrifugal action. The shell resting in the carriage *D* is moved back and forth with a reciprocating motion until all of the tool marks are removed and a bright, smooth curve is obtained, which operation requires about one minute. The stones are grain 60, grade P. The time of the operation is somewhat dependent on the hardness of the steel in the shell. Great care was exercised in determining the proper weight of the bar *B* to give the required pressure upon the grinding stone. This device is operated by a boy and has increased the production in this department of our shell shop to a surprising extent.

Extracts From Chordal's Letters

WE are happy to reintroduce to the readers of the "American Machinist" one of its old-time contributors who for many years under the name of "Chordal" instructed and entertained this paper's readers. Nearly 30 years have elapsed since "Chordal" last wrote, but his knowledge, is as broad, his observation as keen and his style as interesting as of old. Without doubt the older subscribers will recall with pleasure in his renewal some of his previous contributions, such as "Sackett and Wyckoff in Missouri," "Taking Things on Trial," "Angles and Pitches of Screws," and others, and the younger ones we believe will avidly look forward to his prospective Extracts.

Mr. Editor:

This letter is somewhat belated, as I find it is over thirty years since I answered your last letter to me, but to make an excuse for neglect I will explain that I have been busy.

* * * Thirty years is not much, but that length of time cannot pass without something happening. I believe blue-chip tool steel and blueprints have been invented since I wrote you last. I am not sure about the blueprint matter, but I do remember that one of my last letters to you called your attention to a certain nice way of mounting drawings for shop use, the drawings being real drawings pasted on boards and nicely varnished. These drawings cost a lot of money and were expensive things to send into the shop, but so it was, and one of them would cost as much as 50 blueprint copies of it. Now you cut off metal with the oxyacetylene torch, and you fly through the air, and you have machine shops with lots of daylight in the daytime and with plenty of light in them at night. I could fill this letter with merely a brief catalog of shop things which have happened during the 30 years in question, and possibly I may have something to say about some of them later.

* * * And Benny Bennett has gone to the wars. You remember Benny in his father's shop, a stripling in short breeches standing on a block and trying to file something at a full-grown vise. He is a select. He was selected by his Congressman from a lot of the keenest young chaps you could ever come across—selected for West Point. Four years there of intensive study and training and not a little of knockout personal fighting and Benny gets his diploma together with a recommendation for a commission in the army. And then the President, reposing confidence in the zeal and loyalty of Benjamin Bennett, puts his handwriting on Benny's commission as a second lieutenant of artillery. Thereupon, like the girl just engaged, Benny proceeded to buy clothes, according to army regulations. And then it is artillery firing at Fort Sill, and then it is years of service, and then it is the war we have on hand today, and we find Benny in France picking up points of service to be imparted to artillery officers training over here for service over there. I saw Benny the other day, but those fine clothes were packed in moth balls and Benny is in olive drab with a Major's leaves on his shoulders.

* * * This was the same Benny you saw standing on a block trying to file up something before school. You would have thought that his future was a shop future, but it has proved far from it. When he was trying to do that filing I suppose he was wrestling with decimal fractions, but now he grows fat on such a crazy-looking thing as this:

$$\frac{p}{g} k_2^2 \frac{(2v \tan \phi)^2}{2d_1^2} = \frac{p}{g}\left(\frac{2k_2}{d_1}\right)^2 \tan^2 \phi \frac{v^2}{2}$$

* * * If you asked Benny what this is he will say, "Something we use in interior ballistics," and you will be very much pleased to know this and you will possibly acquire some new understanding of the dangers of an artillerist's life, though Benny will explain to you that you are mistaken and that the thing is not a modern high explosive.

* * * Those thirty years have made Benny grow, and he no longer needs a block to stand on and no mental vise bench is too high for him. His familiar talk about the angle of departure and the maximum ordinate and the cone of dispersion is merely his primer talk.

* * * This matter of the lapse of time reminds me that when I was a cub in the shop I was one day running a lathe. I remember the lathe very well and could, I believe, sketch most of the details about it and the curves of those details. It was a new, bright, 24-in. lathe about 25 ft. long and I had in it a 1½-in. rough shaft intended for a bolt in a flour mill. I had the steadyrest on and the cathead and had turned up about six inches on one end. In came Pony Boyd. Pony was my crony; he was a lawyer, and had just been elected to Congress and had never been in a shop before and he was not pleased with it—either the color of it, or the color of his friend, or the noises, or anything he could see. He came to say good-by and criticised things—me particularly. He did not seem to like the particular manner in which the black grease was on my face or on my clothes, and the only thing that seemed to look decent to him was the paper cap I wore, scientifically folded up out of a newspaper. I explained my work to him and I explained the lathe, and showed him which was the lathe and which the work being done, and I think that this is all that Pony ever did know about a lathe. He could not see that anything was being accomplished until I showed him the little pile of chips on the floor, and the chips being formed by and falling from the tool; and I had him put his finger on one of the Vs of the lathe so that he could appreciate the fact that the carriage was actually advancing. He bade me good-by and shook hands with my elbow and wiped his fingers on my shirtsleeve, and that was the last of Pony.

* * * After I had finished my apprenticeship and

had roamed the world and worked in many shops, the lapse of years brought me back again to a job in that same shop and on that same lathe which was now brown instead of bright, and battered on most of its sharp corners and with two slots in the faceplate broken out into one. The old tailstock wrench was gone, and this was an entirely different looking thing and so was the tool wrench. I believe I could point out everything that had been broken and patched and describe what the original shape was.

* * * Now it happened that I was doing precisely the same job as has been previously mentioned, to wit. turning up a 1½-in. shaft for a mill bolt. I had the steady-rest on, with all jaws new, and I had turned up about six inches on the shaft when in steps Pony Boyd whom I had not seen for years. He greeted me effusively, but began to tell me things about myself without asking questions, though he did ask if I had been standing right there in that one spot ever since he had bidden me good-by years before, and I think I told him I had. Then he lit in on my lack of advancement in life and gave me a real lecture.

* * * He says: "Cordy, you do not live at all. You have on the same clothes you had years ago, and you have not washed your face since, and I would be interested in knowing something about the antiquity of the newspaper your cap is made of. And you are not doing any good. When I was here before, that bit that you say cuts something was right where it is now, and there were just as many shavings on the floor as there are now. Since then I have been to Congress twice, and I have been United States Minister to Siam, and I have been to Europe twice, and have traveled all over this country, and here you have been standing thinking you were working. You get paid for it, I suppose."

* * * But later in our renewed chumming, I was able to advise Pony that it was merely owing to a queer set of circumstances that he found me standing in the same spot and in the same facial colors at two times, four years apart, and that I had not been standing there all the time, and that while I had not been to Europe and had not been Minister to Siam or minister to any other seaport I had traveled and seen things—more things than he had ever dreamed of. But that the things I had looked for were entirely different from the things he had looked for. The things I had looked for were generally of metal, and often had holes in them, and the holes often had keyseats in them, and the things often had teeth on their edges, and I saw the best of things for boring these holes, and the best of things for cutting these keyseats, and the best of things for cutting these teeth, and the best methods for determining what shape these teeth should be.

Very respectfully,
CHORDAL.

Better Countershafts for Machine Tools

BY OSBORNE E. BRITTEN

For a number of years there has been an increasing demand for better countershafts. The increased production that modern machine tools are capable of turning out has been gained through the use of high-speed steels, cutting lubricants, increased driving power and greater rigidity in the construction of machines. These changes have thrown increased loads upon the already troublesome countershaft which is one part of machine-tool equipment that has not been improved since the days of slow speeds and carbon steels.

The driving power is transmitted from the line shaft through the countershaft to the machine where the useful work is done. Thus the countershaft boxes receive the maximum load and are an important factor in the transmission of power to the cutting tool. No matter how efficient a machine tool is by reason of its design, the use of an inefficient countershaft penalizes the efficiency of the machine tool and cuts down the possible production.

The efficient operation of any plant using machine tools demands that the tools be capable of keeping up the constant production of work. Plain bearings which require constant oiling and which are usually located in inaccessible positions not only are a source of expense themselves because of the necessity of constant attention and repairs but, by placing a limit on the belt velocity, by frequently interrupting the operation of the machine and by absorbing a large percentage of the driving power, they cut down the production of the plant.

One manufacturer who has carefully kept his costs on machine-tool operations has calculated the expense of plain bearing countershafts as $20.34 per countershaft per year.

MORE EFFICIENT COUNTERSHAFTS

An attempt has been made from time to time to meet the demands for more efficient countershafts by fitting up plain bearing countershaft boxes with ring oiling systems or reservoirs with wicks. Only recently, however, has any serious attempt been made to permanently solve the problem by the use of antifriction bearings in countershaft boxes, clutches and loose pulleys.

Countershafts which run in antifriction bearings assure constant operation because, sliding friction being eliminated, there is no appreciable wear and the operation of the machine tool is not interrupted at any time by hot or sticking boxes. Antifriction bearings improve the operation of a countershaft clutch by insuring positive release when power is not required and by insuring permanence of alignment owing to there being no appreciable wear even through long years of hard service. Loose pulleys equipped with antifriction bearings run quietly and never cause accidents by binding the shaft, which so frequently occurs when plain bearing pulleys stick. By the use of antifriction bearings in loose pulleys it is often possible to increase the belt velocity and thus increase the production.

The power that antifriction bearings will save can either be cut from the total power bill or, better still, applied to useful work at the cutting tool. It is only necessary to observe the number of plain bearing countershaft boxes in use in our factories today to find a constant nonproductive expense which daily adds its load to the power bill.

Productive labor should always be conserved, but especially so in these times when it is so scarce. Loss of man power is wasteful, and the adoption of antifriction bearing countershafts equal in efficiency to the most modern machine tools will help to conserve it.

SIDELIGHTS

EDITED BY E. C. PORTER

Mather Field, Sacramento, Calif., is the new flying field recently completed for the Department of Military Aeronautics. This is the twenty-eighth field in active operation and was named in honor of Lieut. Carl S. Mather, who was killed in service at Ellington Field, Houston, Tex., on Jan. 30.

* * *

The use of tractors for the transportation of field artillery effects an important saving in leather, the supply of which is now a serious problem. A regiment of medium-heavy field artillery requires 125 sets of wheel harness and 333 sets of lead harness, the leather for which would make 11,720 pairs of shoes.

* * *

A large farm-tractor company is having a series of moving pictures made of its farm tractor operating at night by the light of its own electric headlights. These pictures are to be sent all over the world and thrown upon the screen to show the farmers how the machine can be made to work both day and night.

* * *

The "Eastern Sun," a cargo carrier of 9066 deadweight tons, the first one of the 45 steel vessels to be built in Japan for the United States Shipping Board, has arrived in this country and has been accepted and placed in commission under the American flag. This vessel was built by the Kasawaki Dockyard Co.

* * *

More than 800 penalties for violations of rules and regulations governing licensed dealers in foodstuffs have been imposed during the past 10 months by the Food Administration. About 150 companies and individuals have been ordered to quit business in licensed commodities for a limited or unlimited period, and over 500 have voluntarily made a money payment, usually to the Red Cross, or have temporarily abstained from doing business.

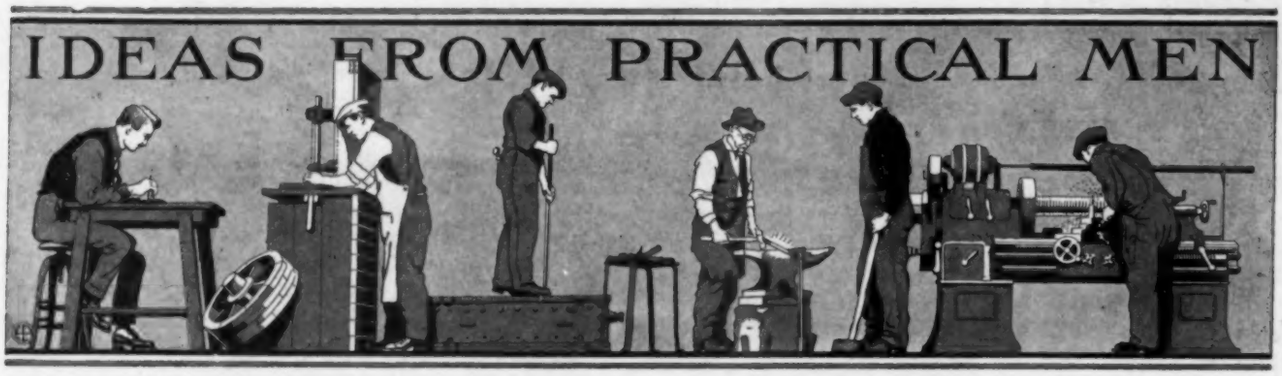
* * *

To gain some idea of the rate of the present labor turnover on a certain railroad, and particularly the extent to which men are being replaced by women, a special record was kept by this railroad for a period of ten days from May 27 to June 5 inclusive. In this 10-day period 4477 employees left the service and 5122 new ones were hired. These figures relate to divisional forces only and do not include the force in the general offices. The most interesting feature disclosed by this record was the rapid increase in the number of women employees on the payroll and the decrease in the number of men. On May 27 there were 5682 women employed by this railroad, and on June 5, in a period of only 10 days, their number had increased to 7227. The total divisional forces have recently been averaging between 148,000 and 150,000. The rate of turnover indicated by the 10-day test is approximately 100 per cent. a year.

Major Gen. E. D. Swinton (Great Britain), the inventor of the tank, in a speech recently said that he got his idea from an American caterpillar tractor which he saw exhibited in Amsterdam in 1914. He also told of the complete secrecy with which the tank was developed, and how the British mechanics worked upon the cumbersome contrivance without any real knowledge of their handiwork. He said that officially authorized rumors were circulated that the tanks were to be used to carry water for the army in Mesopotamia, and it was this rumor he thought that originated the name tank. When turrets with gun apertures were added the "water tank" myth faded and was supplanted by a report that the tanks were to be shipped to Russia to be used as snow plows. This legend stuck and was confirmed by stencilers who inscribed "Petrograd" and various hieroglyphics on the completed tanks which were bound for a secret training field where three lines of sentries numbering 700 surrounded the field. The secrecy in this instance was again so thorough that even the men in the two outer cordons had no idea of what was going on in the field behind the third line.

* * *

To protect the health of workers and others at a time when the labor of every man is needed Secretary McAdoo has directed that the United States Public Health Service give antityphoid inoculations without charge to all who apply to any of its hospitals or field offices. Many of these offices are located in zones surrounding the military cantonments of this country. In Little Rock alone more than 15,000 civilians have been inoculated by the Public Health Service against typhoid fever. Application for inoculation should be made in person to any United States Marine Hospital, to any field office of the Public Health Service, or to the United States Hygienic Laboratory, Washington, D. C. Information as to the nearest place where an inoculation can be given will be furnished on application to the Public Health Service, Washington, D. C. The season of typhoid fever is now at hand and inoculation at this time is of great importance. The effectiveness of this measure in preventing typhoid fever is recognized by the army and navy authorities, and all soldiers and sailors of the United States are inoculated when they enter the service. As typhoid fever is conveyed by swallowing germs previously excreted by typhoid patients the Public Health Service is making every effort, especially in the vicinity of the camps, to improve the means of disposal of human excreta, through both education and demonstrations. The states and localities are coöperating in the work, and in a number of cases they have appropriated large amounts for this purpose. For instance, Congress last year passed a law appropriating money to be spent by the Public Health Service for demonstrations in rural sanitation in localities where an equal amount was appropriated by the state or local authorities. Under this law states and localities have already appropriated over $70,000 in the fiscal ye



Articles Wanted

The *American Machinist* wants articles on actual shop practice in bluing gun barrels, pistol parts, sheet-metal parts and the like. Articles illustrated with photographs or drawings are preferred, but data must deal with the actual work. Receipt-book formulas are not wanted.

Feed-Screw Attachment for Automatic Lathes

By Robert Mawson

Most operators of automatic and semi-automatic lathes are aware of the time necessary to set up a new piece for machining. Much of this time is consumed in frequent trials of the various machined diameters so that the desired dimensions may be obtained. No provision is afforded by these machines to guide the setter-up or operator in knowing how much stock is being removed by the tools. It is therefore a matter of

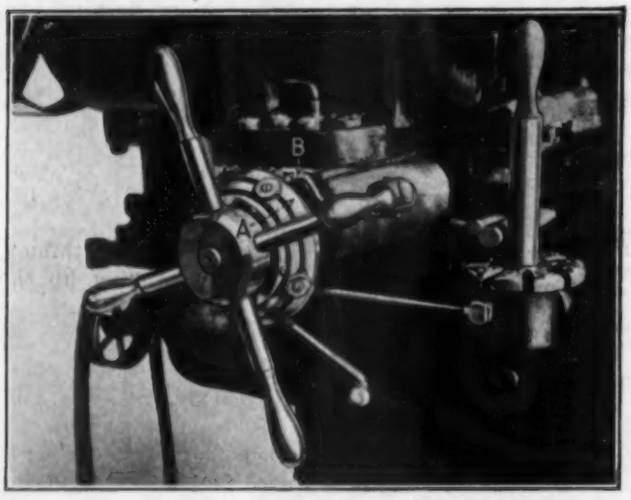


FIG. 1. FEED-SCREW ATTACHMENT IN POSITION

cut and try until the correct tool setting has been obtained.

In Fig. 1 is shown an attachment which the Hemphill Manufacturing Co., Pawtucket, R. I., has placed on Jones & Lamson automatics to simplify the setting-up operation.

This device consists of a disk *A* attached to the outer end of the feed screw. The attachment is shown in detail in Fig. 2. The disk is approximately 6½ in. in diameter and fastened to the lead screw with a key at *B*.

The periphery *C* is graduated to represent 0.001 in. of feed of the screw. A slot is machined at *D* the entire circumference of the disk. Into this slot are fitted the washers *E*, which are threaded to suit the screws *F*. This screw passes through a small indexing washer *G*. The attachment is arranged with six of these washers —one for each of the tools in the turret head.

It will also be noticed that the washer is subdivided into six parts, which are marked as shown on the detail. To use the attachment the operator places the part to be machined in the machine and places the tool for the first machining operation in position. The feed

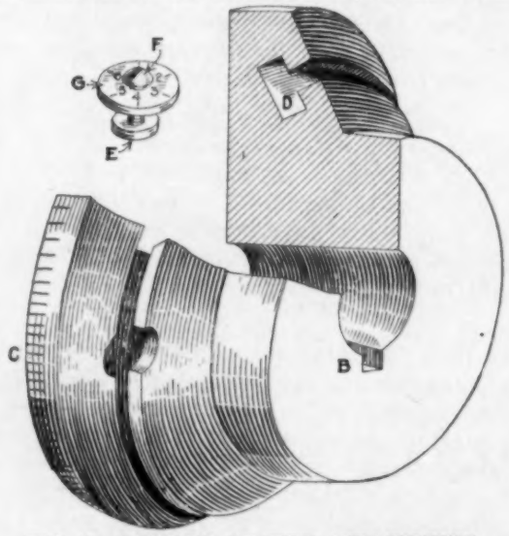


FIG. 2. DETAILS OF THE ATTACHMENT

is then set up in the usual manner with the screw until the correct size is obtained. It can readily be seen that the graduation on the periphery of the disk being thousandths, they are of good service for the operator.

When the correct size has been obtained one of the washers *G* is then placed opposite the index finger *B* (Fig. 1), with the No. 1 in line with the finger, and fastened in position by tightening *E* and *G* together by screw *F* (Fig. 2). The second setting is then obtained in a similar manner, a washer with No. 2 being similarly fastened in position. A similar procedure is followed for all the operations—as many as are required for the part in question. It might be well to add that the various tool heads of the turret are also marked 1 to 6 as a further guide for the machinist.

When any one of the tools is in line for its operation the man simply revolves the feed screw until the washer bearing the same number is in line with the machin-

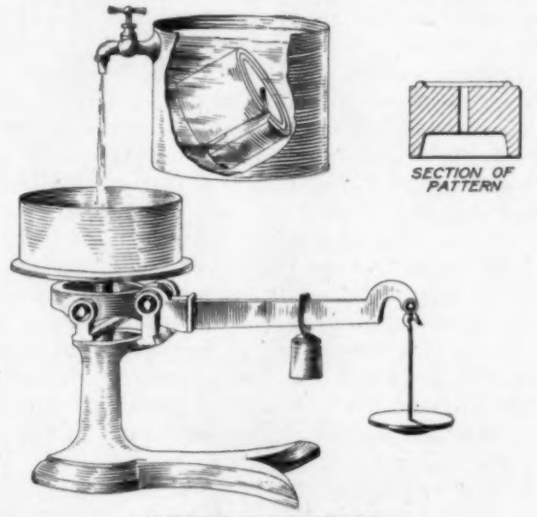
ing operation, knowing that the correct size will be obtained. The machining of the part is then a simple matter, since by this method all guesswork is removed and quick and accurate results are obtained.

One thing may also be noted that as the disk is of a generous diameter the graduations are also a good distance apart, thus affording the obtaining of divisions of 0.001 of an inch should it be found desirable.

Weighing Patterns and Castings by Their Displacement of Water

By W. H. Sargent

The writer was puzzled to know how to find the size of a pattern for a scale weight the casting from which was to weigh a certain definite amount. The pattern was of such irregular shape that its volume could not be accurately computed, and it was not possible to take off a trial casting. In my trouble I remembered Archimedes and his stunt with the king's crown, and I thought if I could find the weight of a quantity of water equal in volume to the pattern then the casting would be to the pattern what the weight of iron is to the weight of water. I punched a hole through the side of



WEIGHING BY PROXY

a tin can near the top, filled it with water to that point and immersed the pattern. I caught and weighed the water that ran out, which was, of course, equal in volume to the pattern. Multiplying the weight of my "water casting" by the specific gravity of cast iron gave me the corresponding weight of an iron casting.

This method can of course be applied to other metals by using the specific gravity of the desired metal. It makes no difference whether the pattern is of wood or metal, providing it is completely immersed and not floated.

Another practical application of this principle is finding the weight of a casting when no scale is at hand large enough to weigh the casting itself. Fill a pail or tub exactly full of water. Immerse the casting; catch and weigh the water that overflows; multiply the amount by the specific gravity of the material and you have the weight of the casting. Thus a casting of nearly 200 lb. can be weighed "by proxy" on a 25-lb. scale with a considerable degree of accuracy.

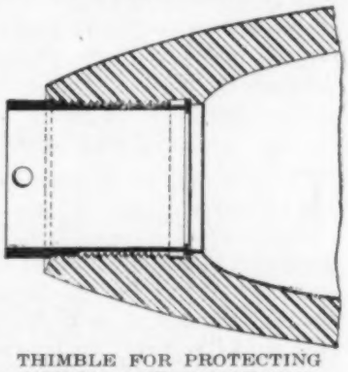
Protecting Thread in Spindle Nose from Varnish

By H. A. Wilson

Official regulations in the manufacture of the 4.5 British high-explosive shells do not permit any trace of the lacquer or varnish with which the interior of the shell is coated to appear in the threads or the recess below the threads of the nose of the shell. Manufacturers are also requested not to use brushes or guns in applying the varnish. All varnish must be poured in the shell and later the shell drained. Air-drying varnish is not permitted; all varnish is to be of the baking copal variety.

As the surplus varnish that is poured into the shell is drained off, some kind of a protector for the thread and recess is necessary. Varnish cannot be cleaned from the threads with taps, as the cuttings drop into the shell and mar the varnish. It is difficult to clean varnish out of the recess either before or after baking.

The illustration shows how the trouble is overcome. The thread in the nose of the shell is of 2-in. diameter, 14-pitch Whitworth form. No standard form of gas or steam pipe suited the purpose, therefore scrap bits of 2-in. standard boiler tube were used. A thimble is made of the boiler tube, as shown in the illustration, by turning back the outer diameter of the tube for a distance somewhat less than the total length of the part to be protected and cutting three or four turns of thread upon the remaining portion. A rubber washer is placed in the recess, the thimble is put in place, the threads engaged and the thimble screwed down, making a joint that effectually excludes the varnish. Two small holes in the top of the thimble provide for the use of a spanner in making up the joint. It is necessary that the joint be tight as the shells are baked nose down. Common rubber packing $\frac{1}{16}$ in. thick is used for making washers, and it is cut with a circular stamp made in the toolroom.



THIMBLE FOR PROTECTING THREADS FROM VARNISH

Although this method wastes a great deal of packing, as the washers can be used but once, it costs the firm but one-third of the amount quoted by a well-known rubber company for supplying them. The cost of the washer is trifling compared with the wages of men to clean the threads and recesses with taps and varnish remover. The use of a liquid varnish remover is not advisable, as careless workmen are apt to spill some of the liquid in the varnished shell, which necessitates sandblasting and revarnishing.

The thimbles are boiled in a strong solution of lye, which cleans them thoroughly in a few minutes. Up to date we have not learned the life of the thimbles, as a few hundred have been in constant use for many months, and thousands of shells have been varnished in a satisfactory manner.

Editorials

THE editor wishes to thank all those who so courteously replied to his recent letter of inquiry. The care with which the replies were prepared and the suggestions contained therein will be very helpful and are highly appreciated.

Rehabilitation of Soldiers

THE United States is not going to be content with merely reëducating and rehabilitating its soldiers who have been disabled by wounds and fitting them for useful and gainful occupations; it is not going to leave them to shift for themselves, but it will exert an active continuing interest in their welfare.

This does not mean that the Government is to coddle them or treat them as weaklings, but it is going to take an active interest in securing them work, and in other ways endeavor to make up for them the opportunities and advantages they lost by reason of wounds received in fighting their country's battles.

Chordal Comes Back

TO THOSE of us who have known the *American Machinist* for over thirty years the return of Chordal to our columns is like welcoming an old friend who has been sadly missed. And even to those who came too late to read his frequent letters, the name of Chordal stands out as a classic in technical literature.

It would probably be impossible to sum up in a few words the great changes which have taken place in machine-shop practice more completely or more vividly than Chordal has done in the second paragraph of his letter, which appears on another page. The blueprint and the oxyacetylene torch are many years apart in machine-shop chronology, and yet they are both new since his last letter appeared in these columns.

In behalf of our older readers we welcome Chordal as an old friend. And to the later generation we can only say that after reading a few of the letters themselves they too will feel as though they had always known Chordal.

A Large Saving of Steel

AS A VITAL war measure the use of motor trucks to conserve steel and relieve transportation congestion is a practical plan that should be given attention. By using the highways to carry merchandise direct from shipper to consignee, thereby eliminating transfers at points of shipment and destination, much of the freight now carried by railway could be carried by automobile at a great saving of time, expense and material—all three factors of importance at present.

It requires approximately 1,437,000 tons of steel to build 50,000 steel freight cars and 1250 locomotives, but it takes only 300,000 tons of steel to build 200,000 motor trucks having an equal ton-mile freight-carrying capacity. This item alone shows a saving in steel of over 1,000,000 tons. From figures at hand it is estimated that it requires 25 tons of steel to build one freight car and 150 tons to build one locomotive with tender. For a motor truck it is estimated that 1½ tons of steel are used in a 2-ton truck.

According to official railroad figures the freight-car ton-mileage is 40 tons, average load, and 20 miles a day. The ton-mileage of a motor truck carrying a 2-ton load is 100 miles a day, which can easily be done in intercity work. These figures prove, therefore, that four 2-ton trucks will do the work of one freight car, with the consequent saving of all the factors enumerated.

The Future of Russia

THE article by Sterling H. Bunnell, which appears in another column, should be read carefully by all who are interested in the future of Russia both for its own sake as an example of democracy and as a prospective market for machine products of various kinds. This is a time for particularly clear thinking, as there seems to be every opportunity for taking the wrong step and not only prolonging the war but of leaving us without a possibility of Russian trade in the future.

There is a very decided clamor for armed intervention on the part of the daily press. And this in spite of the fact that some of the papers which in their editorial columns are urging the landing of troops are printing in the same issues letters from their own correspondents in Petrograd and Moscow pointing out that armed intervention at this time, particularly by any one nation, is almost sure to throw the whole country into the arms of Germany and cause the loss of Russia not only as an ally during the war but in all her future trading after the war.

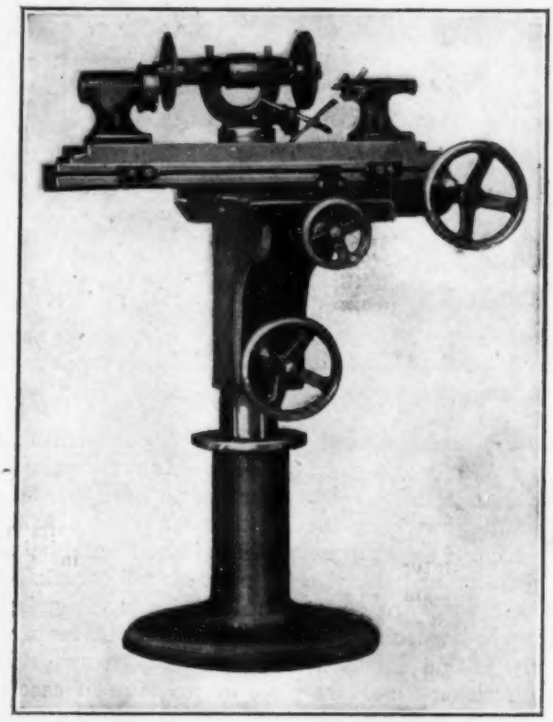
Mr. Bunnell speaks from actual knowledge, having spent about a year in Russia since the revolution, and is keenly interested both in the commercial development of Russia and our relations with that nation. He points out clearly why thousands of the Russian peasants were brought to believe that peace at almost any price was better than war conducted as it had been in their case.

Every nation has its dreamers, many of whom are naturally impractical. Without dreamers we would never have had our own revolution, and some of our declarations in 1776 seemed as radical and as unworkable to the majority at that time as those which have been proclaimed by the present government in Russia. Let us proceed cautiously and with the utmost sympathy for a people trying to free themselves under extremely adverse conditions. Let us forget personal prejudice and look with favor only on such a course as will aid them and at the same time help us in securing democracy for all the world. This seems to be the only way in which we can maintain future relations with Russia, that country which is so full of promise in commercial and other developments.

This department is open to all new equipment of interest to shop owners. Photographs and data should be addressed to Editorial Department, "American Machinist"

Coates Universal Tool- and Cutter-Grinding Machine

The Coates-Kendall Corporation, 50 Church St., New York City, is now marketing the Coates universal tool- and cutter-grinding machine shown in the illustration.



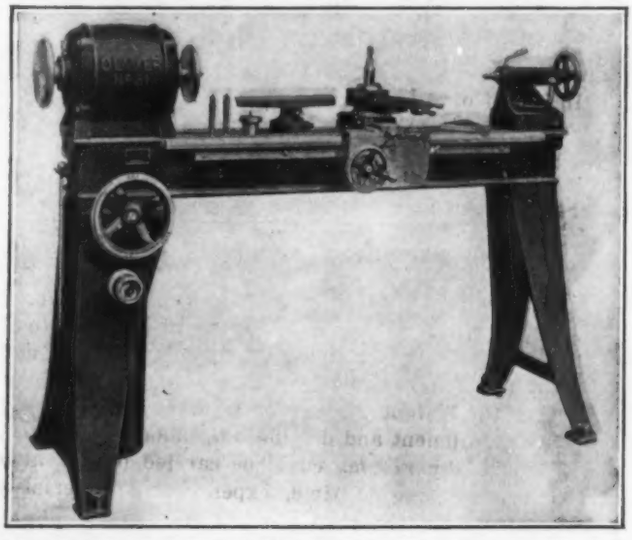
COATES NO. 6 UNIVERSAL TOOL AND CUTTER GRINDING MACHINE

Swing between centers, 8¼ in.; maximum capacity for face mills on universal holder, 18 in.; distance between centers, upper table, 15 in.; distance between centers, lower table, 19 in.; longitudinal feed, 18 in.; cross-feed, 9 in.; vertical adjustment, 8 in.; speed of countershaft, 600 r.p.m.; main-spindle speed, 3000 r.p.m.; internal-spindle speed, 15,000 r.p.m.; chuck capacity, 4 in.; diameter of hole in grinding wheel, ½ in.; floor space, circle 60 in. in diameter; net weight, 700 lb.

This machine is known as the company's No. 6 and is adapted for all sorts of tool and cutter grinding as well as work on jigs and fixtures. The bearings are of bronze, are adjustable for wear and are of the dust-proof type. It is claimed that the lubricating features throughout the entire machine are such that wear and friction have been reduced to a minimum. In case a machine is desired for manufacturing work it can be equipped with air or electric chucks for external or internal grinding work. Special fixtures allow thread cutting or the grinding of chasers, and the universal vise furnished is claimed to be particularly useful. The attachments include internal grinding attachments, bevel-mill holder, wrenches, dogs, tool rest for hand grinding, 4-in. three-jaw chuck, chucking attachment, cutter-grinding attachment, taper-shank holder for forming cutter attachment, head and tail centers, pulleys for driving internal-grinding spindle, grinding wheels, universal vise with micrometer attachment, taper-shank and mill holder, universal tool rest, belt for internal-grinding attachment, adjustable stops for long slide, clamps for circular grinding and die-chaser grinding attachment.

Oliver No. 51 Alternating-Current, Motor-Headstock Lathe

The lathe shown in the illustration is a four-speed, alternating-current, motor-headstock speed lathe designed for three-phase, 60-cycle, 220-volt current. It is known as the No. 51 machine and is one of the recent products of the Oliver Machinery Co., Grand Rapids,



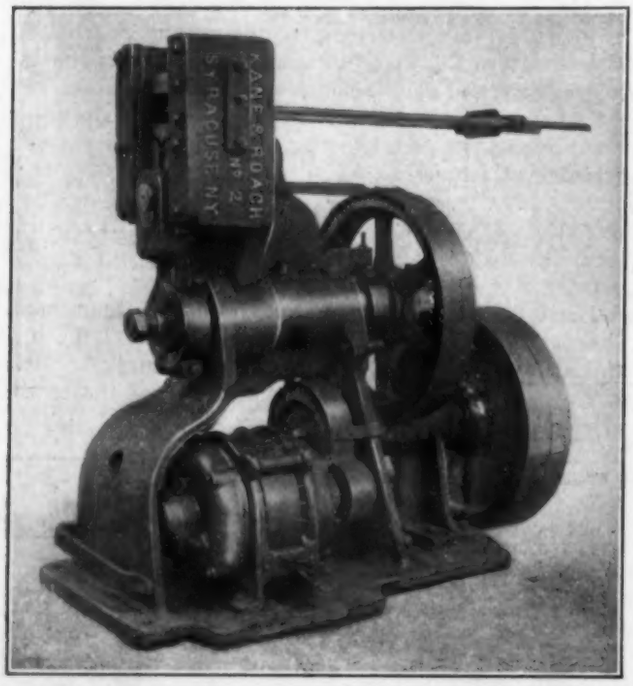
OLIVER NO. 51 FOUR-SPEED, ALTERNATING-CURRENT, MOTOR-HEADSTOCK SPEED LATHE

Mich. The illustration shows the machine equipped with hand-feeding carriage and compound-swivel rest, but it may be furnished with plain bed in 4- or 5-ft. lengths so

as to turn 24 or 36 in. between centers respectively. The swing is 12 in. The spindle is mounted on ball bearings which, together with the motor, are entirely inclosed and dust proof. The rear end of the motor is fitted with a combined handwheel and faceplate; the outer end is rounded off like a handwheel and the inside face is curved so as to give the advantage of a handwheel shape, but the outer surface is straight and flat and forms a faceplate for rear-end turning. The controller is similar to a street-car controller, except for size, is mounted inside the left leg, and operated by means of the handwheel shown at the front. This is marked in various positions for speeds as follows: Off, 570 r.p.m., 1140 r.p.m., 1725 r.p.m. and 3450 r.p.m. All parts of the machine are claimed to be interchangeable in case repairs are necessary.

Kane & Roach Drill-Rod Shears

The illustration shows a new machine for shearing drill rod that has been placed on the market in two sizes by Kane & Roach, Niagara and Shonnard Sts., Syracuse, N. Y. The No. 2 machine illustrated is arranged to handle stock from about needle size up

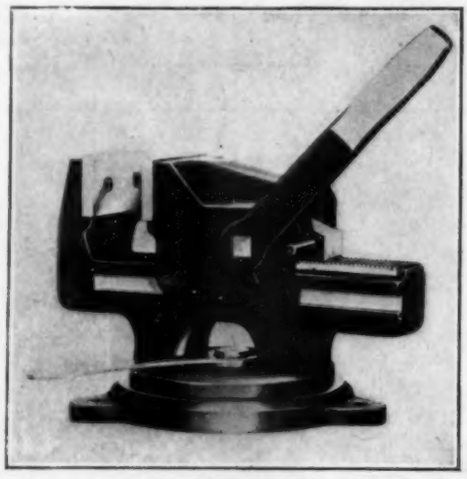


KANE & ROACH NO. 2 DRILL-ROD SHEARS

to and including ½ in. in diameter, while the No. 3 machine is arranged for handling work from ½ to ¾ in. in diameter. It is claimed that these machines will cut drill rod square and clean and will do it without distorting the end of the bar or leaving marks or flat spots on it. On the No. 2 machine the dies are so made that a separate hole is provided for each size of rod, it being possible to have from 12 to 15 different holes in the dies. The sizes of these holes are arranged as the customer may desire. The stationary and sliding shear blades are made alike and they can be adjusted either up or down or endwise to keep them in proper alignment. The connecting-rod is provided with an eccentric on the crank end so that adjustment can be obtained without interfering with the stroke of the machine. The bearings are of bronze and the gears are machine cut. The machine is foot controlled, is provided with an adjustable stop gage, and is entirely inclosed when in use except for the top part of the machine and the sliding gage. The No. 3 machine has separate dies, only one set being in the machine at a time. Either machine can be arranged for belt or motor drive, the motor customarily being 3-hp. with a speed of 1200 r.p.m.

"Winan's New Idea" Vise

The Barnett Foundry and Machine Co., Irvington, N. J., is now marketing a machinist's bench vise known under the name of "Winan's New Idea" vise. The customary screw and lever have been replaced by a pawl and rack, these being actuated by a handle on an eccentric shaft, which it is claimed will exert a pressure many times that possible with a screw. The adjustments are made instantly with a sliding movement, the pawl, eccentric and sliding jaw forming a toggle joint which brings the greatest pressure to bear on the top part of the jaws. The moving member of the vise slides away from the operator and there is no handle between the operator and the vise to interfere with work. The rack and pawl are of hardened steel and the gripping plates are hardened and ground to size. A feature of the vise is that it may be removed from its swivel base and placed on a surface plate or machine in case this may be convenient. The base of the vise is machined accurately to right angles with the jaws. The vise is made in various sizes, the jaws measuring from 3 to 8½ in. and the openings from 3½ to 12 in.

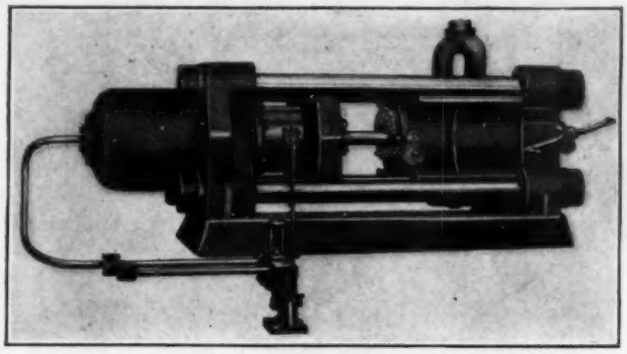


"WINAN'S NEW IDEA" VISE

Southwark Lead-Cable-Covering Press

The Southwark Foundry and Machine Co., Philadelphia, Penn., is now marketing the press illustrated, which is for the purpose of putting the lead sheath on cables. The cable to be covered is fed into the press through roller guides in a curved channel, the radius of which is of such size as to prevent danger of bending the cable at too great an angle and thus injuring it. The cable then passes through bushings and comes in contact with the molten lead, which

fills a ring space between the bushings and the die through which the cable is drawn after being covered with lead. This die smooths out the surface of the lead and reduces the thickness to the proper amount. The leaded cable is then wound on a drum which serves the additional purpose of furnishing the means of drawing the cable through the machine. The press

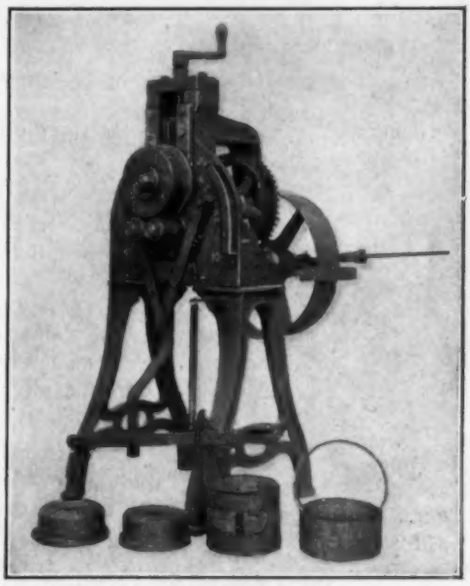


SOUTHWARK LEAD-CABLE-COVERING PRESS

has been built according to the designs of R. Poliakoff. The molten lead is held in two cylindrical chambers and kept under pressure by means of a hydraulic cylinder, the lead being melted in a pot located directly above the press and conducted to the chamber by means of pipe. From these chambers the molten lead passes to the cable, the amount of cable surface in contact with the molten lead at any one time being adjustable. The parts of the press coming in contact with the molten lead are so made that they may be adjusted or repaired at any time without undue trouble.

Kane & Roach No. 16 Bending Machine

The illustration shows the new No. 16 bending machine that is one of the recent products of Kane & Roach, Niagara and Shonnard St., Syracuse, N. Y. This ma-

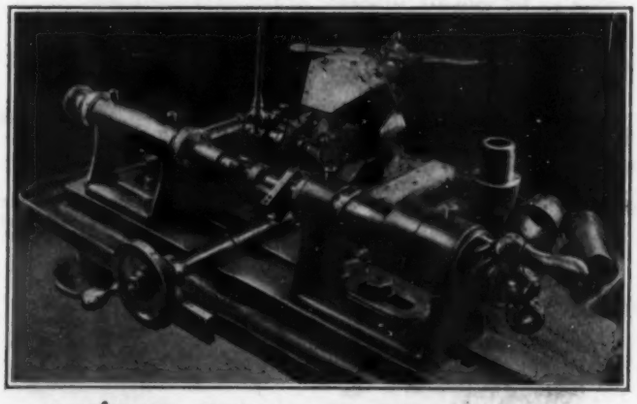


KANE & ROACH NO. 16 BENDING MACHINE

chine is claimed to be the only bender ever placed on the market that will bend the material into a perfect circle leaving the piece free from straight or flat spots at either end. The top roll is adjustable and detachable so that the proper size can be put on to roll the circle desired, the material being bent tightly around this upper roll by the two lower rolls, which are of corrugated steel and hardened. The corrugations are for pulling the material through without slipping, but it is claimed that they do not mar the work. The shaft that carries the upper roll is fastened to a sliding head and is adjustable up and down by means of the screw crank shown at the top. The two lower rolls are also adjustable up and down and are mounted by means of an eccentric sleeve so that they may be tightened or loosened while the band is being bent. The construction of the machine is such that the work can be put in place, finished and removed from the machine without necessity for stopping. The gears are all machine cut and arranged with a clutch pulley for starting and stopping. The machine can be made up as desired for various sizes and classes of work.

Community Grinding Machine for Use on Thread Gages

The Community Machine and Tool Works, Inc., 154-56 Grand St., New York City, is now marketing the thread-grinding machine shown in the illustration. The machine is intended primarily for grinding thread gages, the work being carried on centers during the operation. The grinding wheel is held in a fixed position and the work is rotated and moved past it by means of the



COMMUNITY THREAD-GAGE GRINDING MACHINE

crank shown at the right. This crank is attached to the spindle which carries a master screw of the same lead as the thread gage being operated upon. The work is given a corresponding rotary and longitudinal motion by means of a driving dog, the dead center at the left hand of the machine being held to the work by means of a spring. When the work has been moved past the wheel in one direction, the operator simply reverses the direction of motion of the crank handle, thus moving the work past the grinding wheel in the opposite direction. It will be seen that inasmuch as both the forward and backward motions are working periods no time is lost. One of the interchangeable master screws and its bushing are shown in the rear. The master screw is a steel sleeve and is held in place on the spindle by lock nuts. The master screw nut is tapered, and is split and threaded at the end. The nut is put in a corresponding taper hole in the machine and an adjusting collar used on the threaded end to pull the nut into the taper

hole and give the proper fit on the master screw. The crank handle is mounted directly on the end of the spindle, but an improved form is being made in which the end of the spindle is square and slides in a corresponding opening in an auxiliary sleeve on which the crank handle is carried. The grinding wheel is mounted on a short shaft running in female centers in the head. The method of mounting is shown in the illustration, the idea being that it is possible to quickly remove one grinding wheel and its arbor and replace it with another form of wheel for a different variety of thread. An attachment for truing the grinding wheel is an integral part of the machine, a back-and-forth motion of the lever seen at the rear serving to carry two diamond holders alternately across the two faces of the grinding wheel. One of the holders can be seen at the right of the wheel. It will be noticed that two knobs project from the upper surface of the part carrying the diamond holders, these being pins which, when inserted in corresponding holes, give the diamond holders the correct angle for dressing the wheel for grinding threads of various angles. This is a feature that allows the wheels to be quickly dressed to the correct angle.

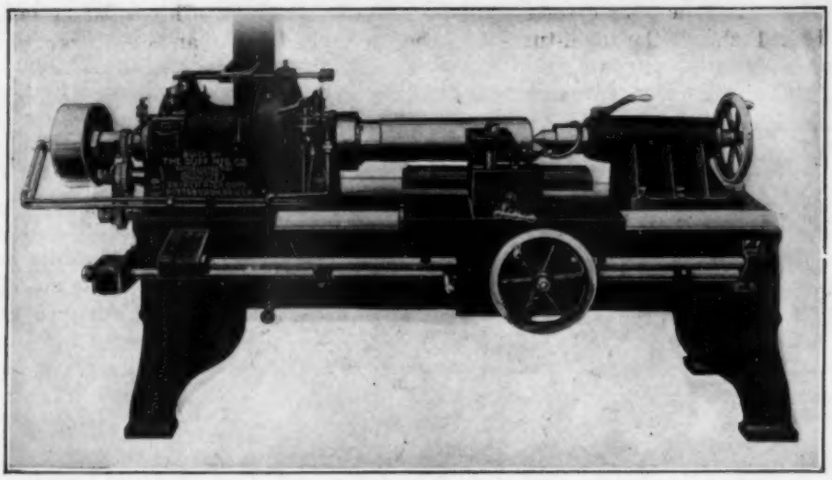


FIG. 1. HINDMAN SHELL-TURNING LATHE EQUIPPED WITH AIR CHUCKS

Swing over ways, 20 in.; swing over carriage, 9 in.; distance between centers with 8-ft. bearings, 38 in.; front spindle bearing, 5 x 7⅛ in.; spindle nose, 2¾ x 4½ in., threaded for U. S. S., 4 pitch; size of hole in spindle, 1½ in.; centers, Morese No. 6; diameter of driving plate, 11 in.; feeds regularly furnished, 0.125 in.; optional feeds, 0.020 to 0.100 in.; diameter of tailstock spindle, 4½ in.; travel of tailstock spindle, 8 in.; width of bridge, 10 in.; size of tools regularly used, 2 x 1 in.; width of belt, 5 in.; back gear ratios, either 25.3, 18¼, 14¼ or 11 to 1, as desired; length of carriage, 30 in.; feed screw, 2 in. diameter, 4 pitch; width of bed over shears, 26½ in.; depth of bed, 16 in.; pitch of feed gears, 6; weight with 8-ft. bed, approximately 6000 lb.

Duff "Hindman" Shell Lathes

The illustrations show two lathes that have been placed on the market by the Duff Manufacturing Company, Pittsburgh, Penn. These machines are of the 20-in. size and are designed especially for ammunition work, being particularly adapted for machining 155-mm. and 6-in. shells. The drive may be direct from the line shaft, through a countershaft or direct from a motor. A 5-in. belt is used and the loose pulley is fitted with roller bearings and is smaller in diameter than the tight pulley in order to relieve the belt strain when the machine is idle. The spindle is of hammer-forged steel, heat-treated and ground to size and is lubricated by means of a well in each bearing cap, which is fed through a sight-feed oiler and from which wicks lead the oil to the spindle-bearing surfaces. The spindle thrust is taken up at the rear by means of self-aligning ball bearings and all gears are of steel, cut from the solid. One spindle speed only is provided and this may be furnished in any of the following ratios: 11, 14¼, 18 or 25.3 to 1. The apron contains but two gears, which control the hand operation of the carriage in both directions, the operating lever being located at the extreme left. Quick return is accomplished by throwing the operating lever into reverse and shifting the belt from the tight to the loose pulley by means of the lever located at the top of the headstock. By this arrangement the main spindle is at rest while the quick return is operating, thus protecting both the work and the operator. Automatic trip-off knock-out stops are provided on the control rods on either side of the apron. The feed is obtained through a center-screw drive which is claimed to give increased power and evenness of pull. The feed regularly furnished is 0.125 in., but any other feed desired can be ordered as an extra. The ways are of the round-bar type and the bed is reinforced at various points. Extras such as rear tool slide with front control, quick return in both directions, change gears for spindle feeds, change gears for feed speeds, special-sized hole in spindle and extra length

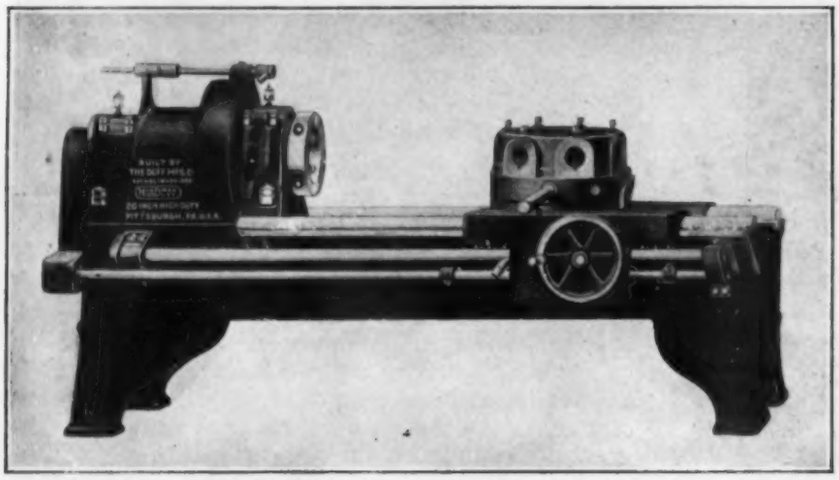


FIG. 2. HINDMAN SHELL-BORING LATHE

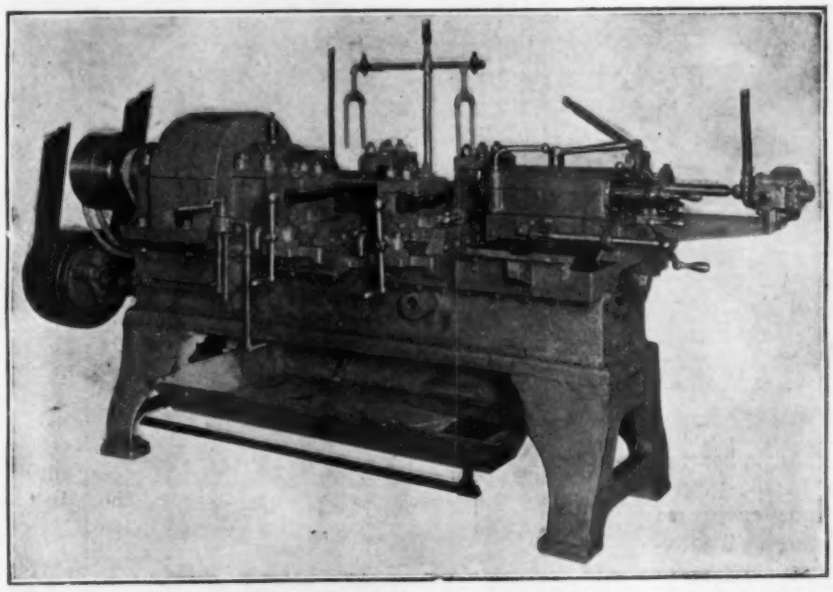
Swing over ways, 20 in.; distance from face of turret to face of spindle, 33 in.; front spindle bearing, 9¼ in. in diameter and 7⅛ in. long; spindle nose, 14¼ in. diameter and 3 in. long; size of hole regularly furnished in spindle, 7⅛ in. in diameter and 25 7/8 in. deep; feed regularly furnished, 0.060 in.; optional feeds, 0.20 to 0.125 in.; distance across flats of turret, 18 in.; size of hole for bar, 3 in.; back gear ratios, 25.3, 18¼ or 11 to 1, as desired; length of carriage, 30 in.; feed screw, 2 in. in diameter, 4 pitch; width of bed over shears, 26½ in.; depth of bed, 16 in.; pitch of feed gears, 6; approximate weight with 8-ft. bed, 6000 lb.

of bed can be furnished if desired. The machines can also be arranged for two-speed countershafts or with two-step cone pulleys giving four spindle speeds in connection with one gear change.

Fig. 1 shows the shell-turning lathe equipped with an air chuck. The tailstock is of one piece and is held to the bed by means of six bolts and is equipped with a 4½-in. spindle and handwheel. The carriage is fitted with both front and rear clamps and the toolposts and cross-slides are combined in a one-piece steel casting, the size of tool regularly used being 2 x 1¼ in. The cross-feed is obtained by hand operation. Fig. 2 shows the shell-boring lathe, which is regularly furnished with a six-way turret that is provided with a clamp over the entire surface of the base. The head is a steel casting and rapid traverse forward and reverse are provided for. This boring lathe can also be arranged for single-boring bar or for a tailstock bar.

Wolff Three-Operation Shell Lathe

In the ordinary course of machining high-explosive or shrapnel shells it is customary, first, to cut off the open end of the shell forging to a predetermined length from the inside of the base; second, to drill a center in the outer surface of the base socket; third, to face off the outer surface of the base to a predetermined dimension from the inside surface of the base, thereby making the base of a predetermined thickness. When the work is performed in this manner it requires three separate machines and handlings. To perform these three operations at one handling of the shell, and by performing the first and third operations above enumerated, simultaneously, to materially reduce the length of time required to perform these three operations, is the idea of the Wolff three-operation shell lathe illustrated, which is the product of the Buffalo Pitts Co., Buffalo, N. Y.



WOLFF THREE-OPERATION SHELL MACHINE

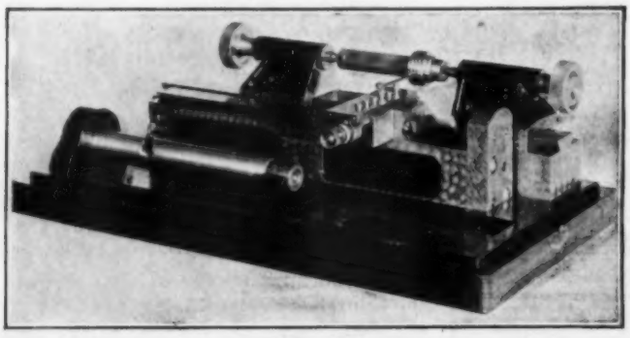
The machine consists of a bed similar to that of the ordinary lathe, the headstock containing a live spindle to which is attached an internal expanding mandrel, which may be operated by air or other means; two carriages, each of which carries two cross-slides, front and rear, upon which are supported the parting and facing cutters, and a tailstock capable of motion which is transverse with respect to the axis of the work mandrel. This tailstock is slidably mounted upon a tailstock slide and is operated by means of a pinion meshing with a rack. This pinion may be rotated by means of a handle or wheel attached to its shaft. The tailstock carries a live spindle provided with an ordinary centering drill. This spindle may be rotated in any manner, by belt and pulley, electric motor or air motor. The spindle has not only rotative movement but is capable of longitudinal movement in its supporting bearings, this movement being imparted thereto by means of a lever fulcrumed on a tailstock and having a yoke which straddles a grooved collar on the spindle. The tailstock also carries a dead center, such as is ordinarily used on turning lathes, this center being capable of longitudinal adjustment. In the ordinary course of usage this tailstock has three steps, or positions, being locked in each position.

Each pair of cross-slides heretofore referred to is operated by a feed screw which has a right and left hand thread, so that when the screw is rotated the cross-slides move toward or from each other, according to the direction of rotation. When fed toward the work the feed screws are rotated by means of wormwheels driven by worms carried on a feed shaft, the wormwheels being locked to the feed screws by means of clutches which can be automatically opened so as to stop the movement of the cutter at any predetermined point. In order to back the cutters away from the work the screws are rotated in the reverse direction by means of handles. The clutches which lock the wormwheel to the feed screws are operated by means of a sliding rod to which is secured an adjustable collar so that the clutch will be disengaged when the cross-slides have moved to the predetermined position. In operating this machine the tailstock is unlocked from the tailstock slide, and the tailstock is moved away from the operator by the rotation of the pinion above referred to. The shell forging is slipped upon the expanding mandrel, which is then operated so as to securely grip the shell forging from the inside, and the shell is then rotated in the usual manner. The tailstock is now moved toward the operator by a reverse motion of the pinion and locked in position with the centering drill directly in line with the axis of the arbor. The drill spindle is then rotated by starting the motor and the drill is fed into the base of the shell by means of the yoked lever. When the drill has entered the proper distance it is returned to its previous position by a reverse movement of the lever, the tailstock is unlocked and moved by rotating the pinion so as to bring the dead center directly in line with the axis of the mandrel. The dead center is now fed in the ordinary manner into the centering socket created by this centering drill and affords a strong and stiff support for the overhanging end of the shell forging.

The clutch-operating rods are now pulled forward so as to cause the clutches to engage and thus rotate the feed screws of the cross-slides. This transmits motion to the cross-slides, which approach each other in the manner of ordinary lathe tools, and brings the parting and facing cutters into contact with the rotating shell. When the cutters have entered the shell to the required depth the clutches are automatically released. The cross-slides are backed away from the work, the tailstock moved out of the way and the shell removed from the mandrel.

Sheffield Thread-Lead Testing Machine for Screw Gages

The Sheffield Machine and Tool Co., Springfield, Ohio, is now marketing the testing machine for the lead of screw-thread gages shown in the illustration. The device consists primarily of a cast-iron bed machined all over with two parallel dovetail bearings on the top. On the rear and larger bearing is mounted the centers for holding the gage to be tested and upon the front bearing is fitted the sliding block which carries the indicator slide. Upon this slide is mounted the indicator, which is held in place by means of a small hardened stud which is clamped in position with a small headless setscrew. Both the sliding block and the indicator slide, which has a dovetail gibbed bearing



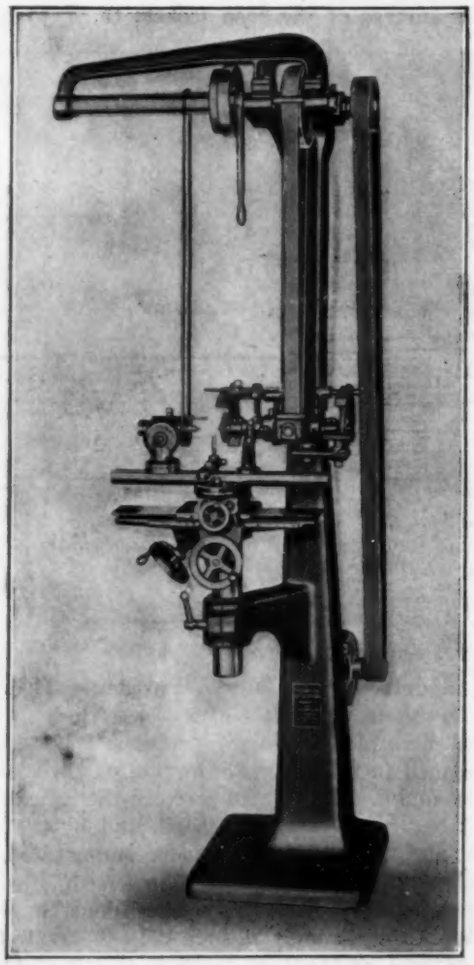
SHEFFIELD THREAD-LEAD TESTING MACHINE

in the block, are sufficiently long to afford ample bearing surface and by mounting the indicator in the proper bushing the operator is assured of a full bearing of the slide in block when the machine is in use. The indicator slide is provided with a knurled stop screw with a locknut to assure that the indicator ball will record from the same point on the angle of each thread after being set on the first thread to be tested. The gage to be tested is mounted between the centers, the heads being clamped in the desired position by means of knurled binding screws in the rear; a gage block being inserted between the contact points (one on the sliding block and two in the steel plate projecting upward from end of bed) to obtain zero reading. The indicator slide is then pushed toward the gage until the ball point of the indicator comes into proper contact with the angle of the first thread to be tested, and the stop screw is set and locked. The gage is then either turned slightly or adjusted longitudinally by releasing one and advancing the other center by means of the threaded spindles with knurled heads until the indicator needle reads zero on graduated scale.

After the zero reading is secured various gage blocks of the proper sizes are inserted and other threads tested. It will be seen that the device is practically a holding fixture for the work and measuring device and the measurements are dependent upon gage blocks and the Deming precision indicator which is used. This indicator is graduated to read to 0.0001 in. with standard-length ball points and to 0.00005 in. with short points. Several sizes of ball points are furnished in each length in order that various-sized pitches may be handled. A chart is also furnished which enables either straight or taper gages to be checked. The hardened and ground test bar shown is furnished with each machine to check the alignment of the two parallel dovetail bearings on the bed. It is claimed that the machine is particularly rapid of operation and that accurate results can be secured where a large number of gages have to be checked.

Thompson Universal Tool- and Cutter-Grinding Machine

The Thompson Grinder Co., East Main and Murray Sts., Springfield, Ohio, is placing on the market a new universal tool- and cutter-grinding machine as shown in



THOMPSON UNIVERSAL GRINDING MACHINE

the illustration. This shows a self-contained motor-driven machine, but it is also made up in a self-contained style driven from a jackshaft located on the column in place of the motor, and in a style belt-driven

from an overhead countershaft. A distinctive feature of the machine is the fixed and immovable grinding wheel which is a feature of the Thompson line of grinding machines. The machine is fully universal, and cylindrical-, surface- and internal-grinding attachments are furnished. The machine is furnished with a large number of attachments, and these include one for concave and convex grinding work. The capacity of the machine between centers is 8 x 12½ in., the longitudinal travel 15 in., the transverse travel 4½ in., the vertical travel 10 in., the net weight 580 lb., the gross weight 730 lb., and the dimensions packed for export are 25 x 30 x 50 in.

The Alien-Enemy Act and What Constitutes an Alien Enemy

The following statement of what the Alien-Enemy Act is and what constitutes an alien enemy is made by A. Mitchell Palmer, Custodian of Alien-Enemy Property:

There are two ways of making war against an enemy. One by force of arms; the other by force of economic pressure. When a nation wages economic war it brings to bear upon the enemy every force it can muster to stop his supply of food, money and munitions, and thereby make him weak and impoverished.

The day the United States entered the war there were in this country millions of dollars belonging to Germans, which were invested in mines, factories, banks, steamships, farms, plantations, etc. The total amount might run into billions, there being then no way of obtaining an estimate. But we did know that it was German gold that was colonizing industries in America and that it was good American money that was being shipped back to Berlin, in the form of earnings, to enrich the German nation, to fill its war chests, to help complete its great plan for world control of commerce and industry.

The Alien-Property Custodian

When war was declared, the army and navy began to mobilize men and guns, the Shipping Board to build a fleet, the War Trade Board to cut all commercial relations with the enemy, and the Alien-Property Custodian to gather into the treasury of the United States every penny of German-owned money that could be found. That is why the office of the Alien-Property Custodian was created.

The duties of the Alien-Property Custodian are exactly what the name implies, only in addition to the work of taking over and administering the holdings of enemies he has been given power by Congress to sell outright those properties belonging to the great industrial and corporation classes of Germany planted here in America.

In order to help it is important to know just who is an enemy and what is enemy property.

Enemy property includes any and every kind of property, money, chattels, securities, lands, indebtedness, accounts receivable, etc., which belongs to an enemy. Even if the property is held in the name of another—by a dummy or in trust—if the real beneficial interest belongs to an enemy it is enemy property. An enemy under the act is:

1. Any person, regardless of citizenship or place of birth which is within the boundaries of Germany, Austria-Hungary or their allies, or within the territory actually occupied by their military or naval forces. A peaceful and law-abiding German or Austrian citizen residing in the United States is not an enemy; but an American citizen living in enemy territory is an enemy.

2. A person residing outside of the United States and doing business within the territory of enemy countries or their allies.

3. A corporation, if incorporated within the territory of enemies or their allies, or incorporated in any neutral country and doing business within the territory of enemies or their allies.

4. An official or agent of an enemy government or any subdivision thereof.

5. All natives, citizens or subjects of Germany or Austria-Hungary interned by the War Department.

Aliens by Marriage

6. All citizens or subjects of Germany or Austria-Hungary resident outside of the United States who are (a) wives of officers, officials or agents of Germany or Austria-Hungary wherever resident; (b) wives of persons within the territory (including that occupied by military and naval forces) of Germany or Austria-Hungary; (c) wives of persons resident outside the United States and doing business within enemy territory.

7. Citizens or subjects of Germany or Austria-Hungary who are prisoners of war or who have been or shall be interned by any nation associated with the United States in the war.

8. Citizens or subjects of Germany or Austria-Hungary who since Apr. 6, 1917, have disseminated or shall hereafter disseminate propaganda to aid any enemy nation or to injure the cause of the United States, or who have assisted, or who shall assist in plotting against the United States or any nation associated with the United States in the war.

9. Citizens or subjects of Germany or Austria-Hungary who are included or who shall be included in the "Enemy Trading List" published by the War Trade Board.

10. Citizens or subjects of Germany or Austria-Hungary who at any time since Aug. 4, 1914, have been resident within enemy territory.

Nos. 2, 6, 8, 9 and 10 apply only to persons resident outside of the United States.

Value of Property Reported to Alien-Property Custodian

Three-quarters of a billion dollars' worth of property have been reported to the Alien-Property Custodian at Washington today, but from investigation throughout the country we know that there is much more not yet located. Here is where the citizens can render valuable assistance. You can help the nation by mailing the Bureau of Investigation, Alien-Property Custodian, Washington, D. C., reports or information on enemy-owned property in your vicinity. You are shareholders in this great combination trust company, department store and auction sale now run by the Government, and the larger you swell its holdings the more you will back up the army and navy now battling against the Hun.

LATEST ADVICES FROM OUR WASHINGTON EDITOR

Washington, D. C. July 20, 1918.—The machine-tool situation is receiving attention and indications are that the question of priorities may be smoothed out. The new classifications have not yet been published in detail, but in general the plan is to abolish priorities A-1, A-2 and A-3, and have A-4 the first on the list, leaving the higher classifications for emergencies, machine tools (and this includes attachments such as chucks and similar parts) coming in as A-6 on the list. Makers of gages, tools and fixtures can get in this classification by proving that their work is for war purposes.

Orders to the mills and foundries from machine-tool firms will automatically take the A-6 classification. Should there be any difficulty in regard to this the matter should be taken up directly with the Priorities Committee of the War Industries Board, which will assist in securing material for those entitled to it. In cases of extreme urgency higher classification can be obtained through the same source.

What Priority Means

There is still some misunderstanding on the part of machine builders in some sections as to what priority really means, the difficulty seeming to be due to a lack of clear understanding as to its object. Priority orders are not primarily for the purpose of securing precedence over all other orders, but to insure delivery on the dates specified by the customer. Some have made the mistake of reshuffling the cards every time they get a new order and of placing all A-1 orders ahead of everything else, regardless of the delivery dates. This is not the purpose of the priority orders and interferes with the general-production program.

The proper method is to watch the delivery dates first and the priority order after. As long as the highest-grade priority can get the machine on the date asked for it does not matter how many machines on lower-grade orders are shipped ahead of it. But if it is found that delivery on a high-grade certificate cannot be made without sidetracking an order with a lower-grade certificate then the lower-grade order must be delayed in favor of the higher-grade certificate. With this point thoroughly understood, many of the difficulties of the past may be avoided.

I am receiving letters from firms that have come into the field during the past year or so regarding their difficulties in securing materials. Some of these may be avoided by placing themselves on the list of machine builders at Washington.

All those who are on the list have received or will receive a questionnaire regarding the needs of their business. This will include coal, iron, steel and other materials needed. All who have not received one of these questionnaires should send for one at once to George E. Merryweather, chief of the Machine Tool Section, War Industries Board, Washington, D. C. Unless firms are on the list at Washington they are not likely to get the materials they need for the future.

The Labor Situation

The Labor Department, functioning through the United States Employment Service, seems to be securing the coöperation of most of those on both sides. The minimum wage, which has been a disputed point during the past few years, seems to have become an established fact in many places, this being the tendency of the new policy. There is also a likelihood of a maximum wage being decided upon to prevent men being induced to leave one plant for another.

We must also recognize the fact that, regardless of our personal opinions in the matter, the eight-hour basic day seems to be gaining ground in the machine industry. This is indicated in the settlement of the controversy between the Worthington Steam Pump and Machinery Co. plants at East Cambridge and at Buffalo and its employees.

This settlement was urged by the Secretary of the Navy as well as others and points to the trend of the times. This does not mean an eight-hour day during the stress-of-war conditions, but it probably indicates that when peace reigns once more this custom will be the universal one. And if it is universal then no shop will be at any disadvantage, so far as hours are concerned, and we can adjust ourselves to the new condition perhaps more easily than we think. This is the time when we must look facts in the face whether in our judgment they are desirable or not.

Instruction in the Use of Gages

The Bureau of Standards has inaugurated a course for training men in the art of measuring gages as well as in using them. This is a desirable step and I can do no better than to refer to the circular of the bureau outlining the course. Two are planned, one of three weeks and the other which can be covered in a week. More details will be given later.

In these courses it is intended to place in the hands of those using and inspecting gages information that has been secured by the bureau in testing and standardizing munition limit gages.

Course A, which covers a period of three weeks, is primarily for men who are directly occupied in gage work, such as gage checkers, foremen of gage shops or gage inspectors. It is intended to give a complete working knowledge of the measurement of various types of munition gages, information as to accepting or rejecting gages, and other information pertaining to the use of master gages.

Course B is for persons who are not directly employed in checking gages, and it aims to convey a general knowledge regarding gaging requirements and fundamentals rather than complete details of gage measurement.

The advantages to be secured in either one of the courses are available to any Government employee who has to do with the use or measurement of gages. The same opportunities will also be afforded to the employees of manufacturers carrying out Government contract for war material.

To arrange for either one of the courses it is only necessary to make application to the director of the Bureau of Standards through the chief of the office, division or manufacturer by which the applicant is employed. The application should make clear the exact position which the applicant occupies, the course desired, and give complete evidence that the applicant is absolutely loyal to the United States Government. Applications should be made two or three weeks in advance of the time the applicant desires to report at the Bureau of Standard for instructions.

Course A will include the following instructions: Organization and routine of gage testing, 1 day; measurement of plain gages, 3 days; measurement of thread gages, lead 2 days, angle 3 days, thread diameter 3 days; measurement of profile gages, 3 days; general instruction regarding use of gages, salvage of gages, gage drawings, specifications and tolerances, 6 days; total, 21 days.

Course B will include the following instructions: Organization and routine of gage testing, 1 day; measurement of plain gages, 1 day; measurement of thread gages, 2 days; measurement of profile gages, 2 days; general instructions regarding use of gages, salvage of gages, gage drawings, specifications and tolerances, 2 days; total 8 days.

The precise order in which the work will be taken up and the actual time spent on each subject will depend somewhat upon the quantity of gages which may happen to be at the bureau for test during the time classes are conducted. Instruction will be accompanied with actual work in the testing and handling of such gages as may be submitted for test during the time classes are being given."

Labor Conditions During May

The New York State Department of Labor presented some interesting figures in a recent bulletin which gives an outline of labor conditions during the month of May in the state of New York.

The total payroll for the month was 6 per cent. higher than in April with every subgroup contributing to this result. The largest gain occurred in the structural-iron group, amounting to 23 per cent., while boat and ship building advanced 15 per cent., and pig-iron and rolling-machine products, cooking, heating and ventilating apparatus each advanced 12 per cent.

A comparison of the total number of employees for the metals group in May as compared with the corresponding month of the previous year shows a gain of 13 per cent., which indicates a substantial expansion in metal manufacturing during that period. Some of the increases are quite startling, firearms, tools and cutlery showing an increase of 75 per cent. during the year. This is modified somewhat when we note that, of the three, firearms alone increased 115 per cent.

In the boat and ship building group the same yearly period showed an increase in employees amounting to 51 per cent., and in structural-iron work 33 per cent. There was a falling off in the employees in gold, silver, and precious stones of 17 per cent.

Comparing wages with a year ago, the most notable increases during this period was in the firearms, tool and cutlery group with 128 per cent.; boat and ship building, 93 per cent.; structural-iron work, 79 per cent.; car, locomotive and railway repair shops, 50 per cent., and machinery manufacturing, 43 per cent. The only wage decline was one of 6 per cent. in the group including gold, silver and precious stones.

Considering these wage increases, the statistics in the same bulletin show that the retail prices of food in the United States increased much faster than the wage rate.

The Shop First-Aid Department

By Herbert L. Carr

Too little practical attention is given to the first-aid department. It is too often placed in the overhead charges as a charitable contribution for the benefit of employees, and the possibility that this department, if properly managed, might pay a larger pro-rata profit than any other department in the shop is not considered. In this connection the old adage, "A penny saved is a penny earned," holds good, and a first aid when run on practical lines will act as a time and consequently money saver.

It is out of the question to give in exact figures the amount of saving realized by such a department, but I will undertake to prove by a comparison of records that the first aid is a paying proposition.

In the shop where the writer is employed in first-aid work we have 2000 employees of both sexes, and the work is manufacturing shells for the United States Government. I find by our records that to each 1000 employees there are 107 calls upon the first aid each day, 26 of these being lacerations, contusions and burns, 8 foreign substance in the eyes, 54 re-dressings, 19 for various forms of sickness. Of these, 5 are given passes to go home (2 from injury and 3 from sickness), and an average of 4 will remain away from work for the day.

Allowing a loss of 10 min. in each case to make this call at the first-aid room and figuring the lost time at the rate of 35c. an hour (the lowest rate paid), this would represent approximately $6. As an injured employee who is unable to continue work is paid for the entire day we will allow one day's wages, or $3.50 for the two, and for the four remaining away due to injuries we will allow the actual time loss, or $14, as

it is conceded that where skilled labor is used a loss for temporary absence is the same to the shop as the amount of the employee's wages. This gives us a total loss of $23.50 chargeable against the first-aid department.

In the shop which I use as a comparison, the line of work is of a similar nature, and the figures are computed upon the basis of 1000 employees, as before. The number of cases seemed to be about the same as in the first example, but for each injury there was a loss in time of from 15 to 25 min. In order to treat an injury or to make a re-dressing it required the aid of a foreman or other employee; therefore the loss of time was not less than four times the amount cited in the previous example, or $24, from this cause alone. Sixteen passes to leave the factory were issued, seven of these being for injury which, calculated upon a basis of 50 per cent. as before, entails a loss of $12.25 a day. An average of 12 injured persons are absent for the day, amounting to a money loss of $42, which added to the foregoing figures approximates a total of $78. From this we subtract the total of $23.50 obtained in the first example, leaving a balance of $54.50 in favor of the shop with the first-aid facilities.

Correctness of Figures

I am satisfied that these figures are not overdrawn, and they are not intended to cover the saving in doctor's bills and reduction in insurance rates where a first aid is maintained. I believe that any shop employing over 250 hands will find the first aid a decided pecuniary advantage.

The prime object of the first aid from the manufacturer's point of view is to keep the employees from going home every time they cut a finger or feel a little out of sorts. When an employee is injured he demands treatment, he knows the dangers of infection, and if he cannot be properly treated at the shop he will go to a physician. The physician finds this class good picking, as he is sure of his pay as a compensation case and not infrequently keeps the employee from work when he might better be back in the shop.

First Aid and Dispensary

There is a difference between a practical first aid and a free dispensary. The first aid should use only a very few simple remedies for such ills as headache, toothache, cramps, coughs and constipation, the treatment in such cases being as much for psychological as for physiological effect. It is neither necessary nor advisable to have a physician in charge, as a trained nurse can handle the work quite as well, is more easily satisfied and takes more interest in the work. If employees are really sick the best place for them is at home where they can call their own physician. The trained nurse can do anything that is required. If the injury is serious the proper place for treatment is at the hospital, and the nurse can render the same first aid that the physician would use until the ambulance arrives, while for small injuries and for dressing, the nurse will take more pains and do the work better than the physician.

Some means must be taken to prevent an employee from going to the first-aid room merely as an excuse to get away from his work. One of the best systems is a pass to be given by the foreman with the employee's name or number and the time of his leaving his work. When the attendant has treated him, his pass is again marked with the time that he leaves the first-aid room, and is returned to the foreman. These passes can all be turned in to the first-aid room each night to check off the records of the day. Of course when employees are seriously injured and require immediate attention the pass regulation would be automatically suspended until the injured person had received proper treatment.

An interesting feature of our first aid is that our records show the names of only a few of the best and most skilled workmen, while it has an almost daily record of the least skilled and laziest. I am sure that any shop will find its first-aid records an interesting study in efficiency. Naturally I would not discharge an employee because he received an injury—the best of them are by no means immune—but the regular patron is careless; his mind is not on his work; he is just as careless with his machine and his work as he is with his fingers, and he is not up to the standard. The trouble with the employee who comes in almost daily with a new pain in a new place is easy to diagnose—plain laziness, and he needs treatment accordingly.

Waste in Wrapping Material

By George F. Kuhne

At this time when economy is an important matter it can be accomplished in numerous ways. High prices are demanded for the various metals, and economy in their use is imperative.

A matter which heretofore has received little or no attention is the manner of binding the various bundles of metals sent out. When such stock is received the binding is invariably as follows: For aluminum, aluminum wire; for copper and brass, copper or brass wire; for steel, iron wire or flat trimmings; for music wire, iron wire or composition, and for brass wire, brass wire.

To illustrate, a quantity of brass, 19-gage B. & S., was ordered in rolls, weighing 15 lb. each. Around each roll was a piece of copper wire of 15-gage B. & S., 2 ft. 9 in. long, which was an extravagant method considering that lower priced material could have been used to advantage.

Reselling Steel

The attention of the War Industries Board has been called to the fact that certain manufacturers now on the preference list for steel supply are reselling steel that has been delivered to them as a result of Government priority assistance.

In order to prevent abuses of this priority privilege, the board has passed a resolution that if any such resales are made hereafter without the approval of J. Leonard Replogle, director of steel supply of the War Industries Board, the manufacturer who is responsible for those resales will be dropped from the preference list and will not receive further priority assistance from the Government.

Student Training-Corps Plans

Details of the plan prepared by the War Department offering to able-bodied college students over the age of 18 the opportunity to enlist in the military forces of the United States and to obtain training in the colleges which will prepare them for the more exacting forms of military service have now been completed.

The plan is to mobilize and develop the brain power of the young men of the country for services that demand special training. Its object is to prevent the premature enlistment for active service of those who could by extending the period of their college training multiply manifoldly their value to the country. If, however, the need arises for the services of these men in the fighting line the terms of their enlistment are such that they can be called by the President on a day's notice. For the present, however, it will be the policy of the Government to keep them in training until their draft age is reached.

War Department's Announcement

Commenting on the importance of special training the War Department, in a recent announcement says: "This is a war in which soldiers are not only marksmen, but also engineers, chemists, physicists, geologists, doctors and specialists in many other lines. Scientific training is indispensable. Engineering skill is needed by the officers who direct every important military operation and who control our lines of transportation and communication. In the same way chemical and physical knowledge are in constant demand at the front as well as behind the lines, while the task of saving the lives and restoring the health of hundreds of thousands of wounded calls for the services of regiments of military physicians. The scientific training which prepares a man to fulfill one of these highly specialized duties and the more liberal training which helps to develop the qualities of leadership needed by the officer or administrator are essential elements of military efficiency."

For the purpose of developing men who shall have this combination of military and intellectual training the new corps has been created and will be called the Students' Army Training Corps. Voluntary enlistment in this corps is open to all able-bodied students in the institutions of collegiate grade who are not under 18 years of age. Students under 18 cannot be legally enlisted, but they may enroll and thus receive military training until they reach the age when they can legally enlist.

Training units will be organized in accordance with the needs of the army and the character of the institution. Most of them will be infantry units, though some schools will have heavy-artillery and light-artillery courses. There may be one or more cavalry units. Schools of medicine and engineering to a limited number will have specialized technical units.

Those Enrolled to Be Equipped by War Department

The boy who enlists in the Students' Army Training Corps will be a member of the army of the United States. He will be provided by the War Department with uniform and equipment, but will be on furlough status and will not receive pay. He will undergo regular military training as a part of his course during the college year, will attend a six weeks' camp for rigid and intensive military instruction with a private's pay, and will be subject to the call of the President for active service at any time should the exigencies of the military situation demand it. The War Department will have the power to order such men to continue in college even after their draft age whenever their work is such that the needs of the service—e.g., for doctors, engineers, chemists and the like—make that course advisable for the good of the country.

The Administration

The Students' Army Training Corps will be administered by the committee on education and special training of the War Department, which will function as a section of the training and instruction branch of the war-plans division of the general staff. Competent officers and noncommissioned officers will be assigned to the various institutions to carry on the work of military instruction. To supplement the officers assigned by the War Department three special summer training camps are being maintained to train a limited number of picked students and members to assist in the work of military instruction.

The camps will be at Plattsburg, N. Y., Fort Sheridan, Ill., and Presidio, Calif., remaining open for 60 days, beginning July 18.

Concluding the statement already referred to, the War Department says: "The importance of this plan for combined military and collegiate training, if we are to meet in the future the urgent needs of the army for highly trained men, is so great that the War Department earnestly requests the colleges, councils of defense and other patriotic societies to coöperate in bringing it to the attention of the young men of the country and in urging them to do their part to make it a success."

Rules for Recruiting Unskilled Labor

Amending the original labor program the Department of Labor states that for the present only manufacturers engaged on war contracts and employing over 100 workers will be required to recruit unskilled labor through the United States Employment Service after Aug. 1. Nonwar industries will be affected only indirectly in so far as they must not offer superior inducements, prevent the transfer of workers urgently needed for war production or in any way attempt to compete with the Government for labor that it desires to secure.

The following five classes of labor need not for the present be recruited through the United States Employment Service, although of course the machinery of the Employment Service is available to all employers seeking these classes:

1. Labor which is not directly or indirectly solicited.
2. Labor for railroads, except in so far as the Director General of Railroads has or may recruit, that recruiting shall be exclusively through the United States Employment Service.
3. Farm labor, which will be recruited through the Department of Agriculture.
4. Labor for nonwar work.
5. Labor for establishments in which the maximum force including the additional number recruited does not exceed 100 employees.

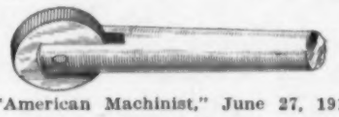
Condensed-Clipping Index of Equipment

Clip, paste on 3 x 5-in. cards and file as desired

Magnet, Hand
Cutler-Hammer Manufacturing Co., Milwaukee, Wis.
"American Machinist," June 27, 1918

The device is for use on 110- or 220-volt direct-current circuits and is furnished complete with 5 ft. of reinforced flexible cord and standard separable attachment plug. It is used for handling small parts of iron or steel in quantities, for separating small iron or steel parts from brass, recovering nails from sweepings, and other like usages. The circuit for the coils is opened or closed by means of the large trigger seen directly beneath the handle, this operating a quick make-and-break snap switch concealed in the cast-aluminum yoke cover

"Sectostyle" for Section Lining
American Sales Co., 311 West 59th St., New York City



"American Machinist," June 27, 1918

This device consists of a handle with a pivoted toothed wheel which the draftsman impresses into the paper on some convenient part of the drawing which is to be cross-hatched, the instrument being held in the hand and moved along the edge of a tee square or triangle in a like manner to that in which a pencil is used. By applying a slight pressure a series of short parallel lines are produced, which serve as a guide for spacing the lines. The guide lines are almost invisible except when being actually used, and do not appear in any reproduction of the drawing. Various spacing of the cross-hatching lines can be obtained by skipping a certain number of the guide lines, and this is done almost automatically after two or three lines have been drawn. It is also said that by using carbon paper and the edge or corner of the toothed wheel that dotted lines may be produced

Drilling Machine, 20-Inch
Weigel Machine Tool Co., Peru, Ind.
"American Machinist," June 27, 1918

Maximum height with spindle extended, 6 ft. 3¾ in.; height to top of cone, 5 ft. 10¾ in.; drills to center of 20½-in. circle; distance from base to spindle, 37½ in.; distance from table to spindle, 19¾ in.; traverse of table on column, 17 in.; traverse of spindle, 8 in.; taper in spindle, Morse No. 3; diameter of table, 16½ in.; diameter of spindle above sleeve, 1 7/16 in.; diameter of spindle in sleeve, 1 7/16 in.; diameter of sleeve, 2½ in.; diameter of column, 5½ in.; ratio of bevel gears, 2 to 3; diameter of large step on cone, 9 in.; diameter of small step on cone, 4 in.; face of cone pulleys, 2¼ in.; weight on skids, 700 lb.

Shell-Cleaning Machine
Gray Machine Tool Co., Inc., 2661-2665 Main St., Buffalo, N. Y.
"American Machinist," June 27, 1918

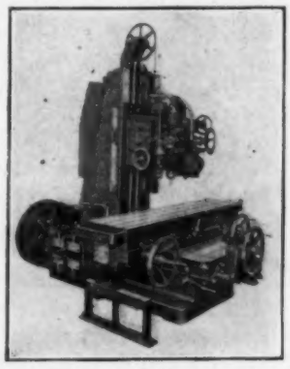
A blast machine for cleaning the inside of 75-mm. shells with steel grit or steel shot. This machine is similar in operation to those used in sandblasting and is equipped with a large hopper and two shell holders and nozzle arrangements. After the shell is placed in position it is lowered so that the nozzle is inside the mouth of the shell which revolves while in this position, the drive being imparted through miter and spur gears. The abrasive is drawn from the hopper by an air blast and cleans the inside of the shell in a few moments, during which operation the operator is unloading and loading at the second station

Truck, Model G Transveyor
Cowan Truck Co., Holyoke, Mass.
"American Machinist," June 27, 1918

This is known as the company's Model G machine. The leverage of the handle is such that the maximum load can be elevated by one man, and several sizes are made with capacities from 1000 to 3000 lb. An improved locking device is incorporated, designed chiefly to safeguard against the load becoming unseated when trucking over uneven floors. It is claimed that the ease and quickness with which the truck can be operated make it particularly desirable

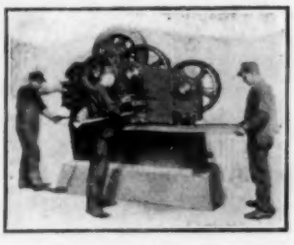
Die-Sinking Machine, Duplex Typeless No. 10
Jackson Machine Tool Co., Jackson, Mich.
"American Machinist," June 27, 1918

Vertical movement of head, 27 in.; center of spindle to face of column, 18½ in.; maximum distance from table to end of spindle, 30 in.; taper hole in large spindle, No. 13 B. & S.; speeds of large spindle, nine, 40 to 413 r.p.m.; speeds of small spindle, nine, 80 to 826 r.p.m.; strokes per minute of cherrying tool, nine, 13 to 138; vertical feeds, nine, 0.0002 to 0.0031 in. per spindle revolution; horizontal feeds, nine, 0.0014 to 0.0187 in. per spindle revolution; vertical feeds per stroke of cherrying tool, nine, 0.0007 to 0.0093 in.; horizontal feeds per stroke of cherrying tool, nine, 0.0043 to 0.0562 in.; cross travel, 18 in.; longitudinal travel, 56 in.; working surface of table, 18 x 72 in.; weight, 12,000 lb.



Shear, Universal Slitting No. 25
Buffalo Forge Co., Buffalo, N. Y.
"American Machinist," June 27, 1918

A combination shearing, punching and cutting machine for use on steel plates and rolled sections. It is built of steel and is claimed to be lighter and stronger than like machines of cast iron. Shear: Capacity, plates up to ½ in. thick and flats up to 3 x ½ in.; length of knives, 8 in.; strokes per minute, 25. Bar Cutter: Angles squared, 4 x ½ in.; angles mitered, 2½ x ½ in.; Ts, 3½ x ½ in.; rounds, 1½ in.; squares, 1½ in.; I-beams, 6 in.; channels, 6 in.; strokes per minute, 25. Punch: Capacity, up to 1 in. hole in ½-in. plate; stroke, 1 in.; strokes per minute, 25. Horsepower required, 5; motor recommended, 7½ hp.; revolutions per minute of high-speed shaft, 350



Index Clip for Rolled Drawings
Ulrich Planfiling Equipment Co., Jamestown, N. Y.

"American Machinist," June 27, 1918

This clip or tag is used on rolled drawings or papers to prevent unrolling and also for indexing or recognition purposes. As will be noted the device consists of a round holder having three small projections, by means of which a small round pasteboard card for indexing information is held. Fastened to the back is a bent portion which slips over the edge of the rolled drawing, holding it firmly. The rolled drawing may then be filled in such a manner that the end shows, and any particular one can be quicly recognised by the information inscribed on the index card

Patent applied for

Personals

J. S. Allen has been given the position of general foreman of the locomotive-erecting shop of the Canadian Pacific at North Bay, Ont.

A. B. Clark, formerly master mechanic of the Chicago Great Western R.R. at Oelwein, Iowa, is now master mechanic at Des Moines, Iowa.

Henry Fischer has resigned as general sales manager of the Verona Tool Works, Pittsburgh, to accept a position with the Proctor & Gamble Co., Cincinnati, Ohio.

V. P. Laporte, formerly with the B. Seabolt Corporation, New York, has been made vice president of the Fortney Manufacturing Co., 13-15 Franklin St., Newark, N. J.

W. H. Foster, president of the General Fireproofing Co., Youngstown, Ohio, has been elected chairman of the Youngstown division of the War Industries Commission.

C. W. Matthews was recently made master mechanic of the Cincinnati terminals of the Kentucky division of the Louisville & Nashville R.R. with office at the Central Covington shops, Kentucky.

L. G. Henderson, secretary and treasurer of Russell, Holbrook & Henderson, Inc., 30 Church St., New York, has recently gone into the United States Army, Coast Artillery.

G. E Schultz, formerly with the industrial department of the Westinghouse Electric and Manufacturing Co., has become manager of Russell, Holbrook & Henderson, Inc., 30 Church St., New York.

E. P. Pfahler, who was master mechanic of the Baltimore & Ohio R.R. with office at Cumberland, Md., is now mechanical engineer of the locomotive section of the United States Railroad Administration.

A. R. Kipp, formerly mechanical superintendent of the Chicago division of the Minneapolis, St. Paul & Sault Ste. Marie R.R. with office at Fond du Lac, Wis., has been transferred to Minneapolis, Minn.

Lewis Russell, president and general manager of Russell, Holbrook & Henderson, Inc., 30 Church St., New York, has resigned as general manager to go into the United States Army, Ordnance Department.

W. Wells, formerly district master mechanic of the Canadian Pacific R.R. with office at Schreiber, Ont., has been transferred to a similar position on the Farnham division of the Quebec district.

C. W. Culver, formerly general foreman of the Central R.R. of New Jersey, now holds the position as assistant master mechanic of the Lehigh & Susquehanna division, with office at Mauch Chunk, Penn.

H. M. Oakes, formerly master mechanic of the Missouri, Kansas & Texas R.R. at Parsons, Kans., has been appointed master mechanic of the Chicago Great Western R.R. with office at Oelwein, Iowa, succeeding A. B. Clark.

Wesley Martin has resigned as assistant superintendent of two ammunition shops at the Bethlehem, Penn., plant of the Bethlehem Steel Corporation to become general superintendent of the Symington-Anderson plant at Chicago, Ill.

E. W. Smith, formerly master mechanic of the Philadelphia division of the Pennsylvania R.R. with office at Harrisburg, Penn., has been appointed superintendent of motive power of the Central division, with office at Williamsport, Penn.

J. M. Wilson has resigned as editor in chief of "Canadian Machinery" and allied publications of the MacLean Publishing Co., Ltd., Toronto, Canada, to accept a position on the engineering staff of the Standard Parts Co., Inc., Cleveland, Ohio.

William Boulton, Bordentown, N. J., formerly chief inspector of tools and gages at the local works of the American Ammunition Co., has become mechanical supervisor in the fuse department of the Keystone Manufacturing Co., Riverside, N. J.

W. A. Haines has been appointed district representative at Detroit of the Westinghouse Electric and Manufacturing Co., East Pittsburgh. Mr. Haines will handle automobile equipment made by the Westinghouse company among the automobile builders in the Detroit territory.

H. O. Penland, who has been connected with the U. S. Ball Bearing Manufacturing Co., Chicago, Ill., as sales engineer, and who has been stationed in Cleveland since the first of the year, has been promoted to be manager of the Cleveland office, 833 Leader-News Building, Cleveland, Ohio.

Obituary

Charles Nägelen, president of the Nägelen Machine Co., 1987 Central Ave., Cincinnati, died on July 9 at the age of 52 years. Mr. Nägelen organized the concern of which he was the head about three years ago. He was well known in the machine trade and in general business and fraternal circles. Mr. Nägelen recently lost his only son, Charles A. Nägelen, in service in France.

Edward Herman Wachs, one of the pioneers of the iron and machine industry of Chicago, died at his home, 631 Wrightwood Ave., on July 9. Mr. Wachs was born in Germany in 1842 and emigrated to this country in his early youth, settling with his family near Sandusky, Ohio, in 1849. In 1866 Mr. Wachs went to Chicago and became associated with the John Davis Co., which he served till 1876, when he started the Chicago Chain Works. In 1883 he disposed of his interest in the Chicago Chain Works to take on new duties in the machinery-manufacturing industry, doing business in his own name.

Business Items

The Napier Saw Works, Inc., Springfield, Mass., have established an office, warehouse and brazing plant at 116 North Clinton St., Chicago, Ill. B. L. Calkins is in charge of the office and plant and he will keep in stock various saws manufactured by the Napier Works, including carbon and tungsten steels. Mr. Calkins has facilities for brazing metal band-saws to length for direct shipment.

N. B. Payne & Co. is the name of the firm organized to take over the business in cranes of all types formerly conducted by N. P. Payne at 25 Church St., New York. No change has been made in the organization.

The Standard Pressed Steel Co., manufacturer of unbreakable "Pioneer" steel shaft hangers, "Hallowell" cold-rolled steel shaft collars and "Standco" hollow safety setscrews, Philadelphia, Penn., has moved its general office and business departments to 20th St. and Indiana Ave., where it is able to give prompt and efficient attention to all business.

Trade Catalogs

Air Compressors—Ingersoll-Rand Co., 11 Broadway, New York. Form 3015-1; four-page bulletin 6 x 9 in., on "ER-I" portable mine-car air compressors.

Grinding and Polishing Machines. Saint Louis Machine Tool Co., 252 Loughborough St., St. Louis, Mo. Circulars (2); 8½ x 11 in. These circulars illustrate, describe and give specifications of the Western grinding machines and the Saint Louis polishing machines.

"Triad" Hardening Furnace. W. R Bennett, Elmwood, Conn. Catalog No. 10. Pp. 8; 3½ x 6½ in. This catalog not only gives a complete description of the "Triad" furnace, which is adapted for preheating, high heating and heating for drawing the temper, but it also gives a few suggestions relating to the successful treatment of carbon and high-speed steels.

Rhodes Shapers and Slotters. The Rhodes Manufacturing Co., Hartford, Conn. Catalog. Pp. 20; 6 x 9 in. Two pages are given to general features of the Rhodes vertical and horizontal shapers; the remaining pages give halftone illustrations and specifications of various models.

Clutches and Cut-off Couplings. Carl G. Westlund Co., Worcester, Mass. Catalog. Pp. 16; 5½ x 7½ in. This catalog gives a number of line and halftone illustrations, tables of sizes and prices and a description of the Star safety friction clutch, Westlund split clutch and cut-off couplings.

Pyrometers. Wilson-Maenlen Co., 781 East 142d St., New York. Catalog. Pp. 24; 8 x 11 in. It illustrates and describes pyrometers, indicators, switchboards, thermocouples and various apparatus for registering temperature.

Standard Specifications for Incandescent Electric Lamps. Department of Commerce, Bureau of Standards, Washington, D. C. Circular No. 13. Pp. 16; 7 x 10 in. This circular gives the general specifications under which lamps are purchased for the Government, including mechanical and physical characteristics of the lamps.

New Publications

Thermal Expansion of Alpha and of Beta Brass—A new publication of the Bureau of Standards, Washington, D. C., being designated as Scientific Paper No. 321. It contains 20 pages 7 x 10 in. and may be had upon request.

This brochure contains the recent investigations of the bureau on the failure of brass articles, rods, bolts, etc., by cracking. Instances have been observed in which cracking occurred in brass articles which had been quickly cooled from a forging or annealing temperatures by quenching or otherwise, and it was considered possible that this may have been due to the development of local stresses in the brass during such cooling. Investigations outlined in this paper were made with a view to ascertaining the approximate magnitude of the local stresses which might be set up in heterogeneous brasses of the type known as Muntz metal, and finding the effects of such stresses upon the mechanical properties of the metal.

Sheet-Metal Workers' Manual—By L. Broemel and J. S. Daugherty. Five hundred and fifty-two 4½ x 6¾-in. pages; 394 illustrations; 32 tables; limp-leather binding. Published by Frederick J. Drake & Co., Chicago. For sale by Peck, Stow & Wilcox Co., Southington, Conn. Price, $2.

This is a very handy and useful little handbook for those who have to do with sheet-metal work of all kinds. It is compiled by men who are well acquainted with the subjects handled, and the information is put in a clear, concise way. It covers the machinery, tools and methods employed in sheet-metal working and should find a large field among the trade as well as in manual-training and technical schools. The numerous illustrations amply back up the text. The various chapters take up the Sheet-Metal Industry; Sheet-Metal-Working Machinery; Sheet-Metal-Working Tools; Sheet-Metal-Working School Shop Equipment; Course in Elementary and Advanced Sheet-Metal Work and Pattern Drafting; Outline Course in Sheet-Metal Work; Emergency War Training; Oxyacetylene Welding and Cutting; Electric Welding; Hand Forging and Welding; Course in Forge Practice; Outline Course in Hand Forging and Welding; Emergency War Training; Brazing; Pipe Bending; Properties of Metals and Their Alloys; Practical Geometry and Mensuration; Useful Tables and Index.

Forthcoming Meetings

American Society of Mechanical Engineers. Monthly meeting, second Tuesday. Calvin W. Rice, secretary, 29 West 39th St., New York City.

Boston Branch National Metal Trades' Association. Monthly meeting on first Wednesday of each month. Young's Hotel. Donald H. C. Tullock, Jr., secretary. Room 41, 166 Devonshire St., Boston, Mass.

Engineers' Society of Western Pennsylvania. Monthly meeting third Tuesday; section meeting, first Tuesday. Elmer K. Hiles, secretary, Oliver Building, Pittsburgh, Penn.

New England Foundrymen's Association. Regular meeting, second Wednesday of each month. Exchange Club, Boston. Mass. Fred F. Stockwell, 205 Broadway Cambridgeport, Mass.

Philadelphia Foundrymen's Association. Meetings first Wednesday of each month. Manufacturers' Club, Philadelphia, Penn. Howard Evans, secretary, Pier 45, North Philadelphia, Penn.

Providence Engineering Society. Monthly meeting fourth Wednesday of each month. A. E. Thornley, corresponding secretary, P. O. Box 796, Providence, R. I.

Rochester Society of Technical Draftsmen. Monthly meeting, last Thursday. O. L. Angevine, Jr., secretary, 857 Genesee St., Rochester, N. Y.

Superintendents' and Foremen's Club of Cleveland. Monthly meeting, third Saturday. Philip Frankel, secretary, 310 New England Building, Cleveland, Ohio.

Technical League of America. Regular meeting, second Friday of each month. Oscar S. Teale, secretary, 35 Broadway, New York City.

Western Society of Engineers, Chicago, Ill. Regular meetings, first, second, third and fourth Mondays of each month, except July and August. Edgar S. Nethercut, secretary, 1735 Monadnock Block, Chicago, Ill.

WEEKLY PRICE GUIDE OF

IRON AND STEEL

The Government Schedule of steel prices went into effect Sept. 24. Pig iron was set at $33 per ton; pig iron differentials were announced by the American Iron and Steel Institute on Nov. 3. Washington announced sheet and pipe prices on Nov. 5. Warehouse prices have been revised, as shown, by agreement between the War Industries Board and the warehouses; new schedule in effect Nov. 15. Effective Apr. 1, the price of basic iron was fixed at $32, and standard Bessemer at $35.20 at Valley furnace, prices of other irons remaining the same as last quarter.

PIG IRON—Quotations per ton were current as follows at the points and dates indicated:

	Current	One Month Ago	One Year Ago
No. 2 Southern Foundry, Birmingham	$33.00	$33.00	$47.00
No. 2X, New York	34.40	.....	53.00
No. 2 Northern Foundry, Chicago	33.00	37.00	55.00
*Bessemer, Pittsburgh	36.60	37.25	57.95
*Basic, Pittsburgh	32.00	33.95	53.00
No. 2X, Philadelphia	34.40	33.75	54.50
*No. 2, Valley	33.00	33.95	55.00
No. 2 Southern Cincinnati	36.90	35.90	49.90
Basic, Eastern Pennsylvania	32 00	33.75	50.00

*Delivered Pittsburgh; f.o.b. Valley, 95 cents less.

STEEL SHAPES—The following base prices per 100 lb. are for structural shapes 3 in. by ¼ in. and larger, and plates ¼ in. and heavier, from jobbers' warehouses at the cities named:

	New York		Cleveland		Chicago	
	Current	One Month Ago	Current	One Year Ago	Current	One Year Ago
Structural shapes	$4.245	$4.195	$5.25	$4.17	$4.50	$4.27	$5.00
Soft steel bars	4.145	4.095	5.00	4.07	5.00	4.12	4.50
Soft steel bar shapes	4.145	4.095	5.00	4.17	4.50	4.17	4.50
Soft steel bands	4.095	.....	.....	.....	.....	.....	.....
Plates, ¼ to 1 in. thick	4.493	4.445	9.00	4.42	8.00	4.52	8.00

BAR IRON—Prices per 100 lb. at the places named are as follows:

	Current	One Year Ago
Pittsburgh, mill	$3.50	$4.75
Warehouse, New York	4.75	4.75
Warehouse, Cleveland	4.10	4.95
Warehouse, Chicago	4.10	4.50

STEEL SHEETS—The following are the prices in cents per pound from jobbers' warehouse at the cities named:

	Pittsburgh, Mill, in Carloads	New York			Cleveland		Chicago	
		Current	One Month Ago	One Year Ago	Current	One Year Ago	Current	One Year Ago
*No. 28 black	5.00	6.495	6.445	10.50	6.42	9.50	6.52	9.50
*No. 26 black	4.90	6.395	6.345	10.40	6.32	9.40	6.42	9.40
*Nos. 22 and 24 black	4.85	6.345	6.295	10.35	6.27	9.35	6.37	9.35
Nos. 18 and 20 black	4.80	6.295	6.245	10.30	6.23	9.30	6.32	9.30
No. 16 blue annealed	4.45	5.695	5.645	10.20	5.62	9.70	5.72	9.70
No. 14 blue annealed	4.35	5.595	5.545	10.10	5.52	9.60	5.62	9.60
No. 10 blue annealed	4.25	5.495	5.445	10.00	5.42	9.50	5.52	9.50
*No. 28 galvanized	6.25	7.745	7.695	13.00	7.67	11.00	7.77	11.00
*No. 26 galvanized	5.95	7.445	7.395	12.70	7.37	10.70	7.32	10.70
No. 24 galvanized	5.80	7.295	7.245	12.55	7.22	10.55	7.47	10.55

*For painted corrugated sheets add 30c. per 100 lb. for 25 to 28 gage; 25c. for 19 to 24 gages; for galvanized corrugated sheets add 5c., all gages.

COLD DRAWN STEEL SHAFTING—From warehouse to consumers requiring at least 1000 lb. of a size (smaller quantities take the standard extras) the following discounts hold:

	Current	One Year Ago
New York	List plus 13%	List plus 25%
Cleveland	List plus 13%	List plus 10%
Chicago	List plus 13%	List plus 10%

DRILL ROD—Discounts from list price are as follows at the places named:

	Extra	Standard
New York	35%	40%
Cleveland	35%	40%
Chicago	35%	40%

SWEDISH (NORWAY) IRON—The average price per 100 lb., in ton lots, is:

	Current	One Year Ago
New York	$15.50–19	$14.00
Cleveland	20.00	12.30
Chicago	19.00	12.00

In coils an advance of 50c. usually is charged.

Note—Stock very scarce generally.

WELDING MATERIAL (SWEDISH)—Prices are as follows in cents per pound f.o.b. New York, in 100-lb. lots and over:

Welding Wire*		Cast-Iron Welding Rods	
No. 11, 5/32, 3/16, 7/32, 1/4 No. 8, 5/16 and 3/8, 10	$3.10 to $3.00	3/8 by 12 in. long	16.00
		1/4 by 19 in. long	14.00
5/16		5/16 by 19 in. long	12.00
No. 12		1/2 by 21 in. long	12.00
No. 14 and 1/16		*Special Welding Wire	
No. 18		1/8	33.00
No. 20		5/32	30.00
		1/4	38.00

*Very scarce.

MISCELLANEOUS STEEL—The following quotations in cents per pound are from warehouse at the places named:

	New York Current	Cleveland Current	Chicago Current
Tire	4.15	4.07	4.17
Toe calk	5.75	4.57	4.32
Openhearth spring steel (heavy)	8.00	8.00	7.60
Spring steel (light)	11.00	1.25	11.90
Coppered bessem r rods	9.00	8.00	7.07
Hoop steel	4.99½	4.75	5.02
Cold-rolled strip steel	8.50	8.25	8.57
Floor plates	6.50	6.00	7.07

PIPE—The following discounts are for carload lots f.o.b. Pittsburgh; basing card of Nov. 6, 1917, for steel pipe and for iron pipe:

BUTT WELD

Steel			Iron		
Inches	Black	Galvanized	Inches	Black	Galvanized
⅛, ¼ and ⅜	44%	17½%	¾ to 1½	7%	17%
½	48%	33½%			
¾ to 3	51%	37½%			

LAP WELD

2	44%	31½%	2	26%	12%
2½ to 6	47%	34½%	2½ to 4	28%	15%
			4½ to 6	28%	15%

BUTT WELD, EXTRA STRONG PLAIN ENDS

⅛, ¼ and ⅜	40%	22½%	¾ to 1½	33%	18%
½	45%	32½%			
¾ to 1½	49%	36½%			

LAP WELD, EXTRA STRONG PLAIN ENDS

2	42%	30½%	2	27%	14%
2½ to 4	45%	33½%	2½ to 4	29%	17%
4½ to 6	44%	32½%	4½ to 6	28%	16%

Stock discounts in cities named are as follows:

	New York		Cleveland		Chicago	
	Black	Galvanized	Black	Galvanized	Black	Galvanized
⅛ to 3 in. steel butt welded	33%	16%	43%	28%	41.9%	26.9%
3½ to 3 in. steel lap welded	15%	+3%	38%	26%	37.9%	23.9%

Malleable fittings, Class B and C, from New York stock sell at list price. Cast iron, standard sizes, 10 and 5%.

METALS

MISCELLANEOUS METALS—Present and past New York quotations in cents per pound, in carload lots:

	Current	One Month Ago	One Year Ago
Copper, electrolytic	26.00*	23.50	28.00
Tin, in 5-ton lots	96.00	85.00	62.50
Lead	7.82½	7.25	10.37½
Spelter	8.62½	7.50	8.75
*Government price.			
ST. LOUIS			
Lead	7.75	7.25	10.12½
Spelter	37.50	7.10	8.50

At the places named, the following prices in cents per pound prevail, for 1 ton or more:

	New York			Cleveland		Chicago	
	Current	One Month Ago	One Year Ago	Current	One Year Ago	Current	One Year Ago
Copper sheets, base	38.00	32.50	42.00	38.00	42.00	33.50	42.00
Copper wire (carload lots)	35.00	31.00	47.50	35.00	46.00	33.00	47.00
Brass sheets	39.75	31.75	39.125	37.00	39.50	31.50	39.00
Solder ½ and ½							
Brass pipe base	46.00	36.50	45.00	40.00	38.00	41.50	43.00
(case lots)	60.00	70.00	39.50	62.00	39.00	70.00	39.00

Note:—Solder very scarce.

Copper sheets quoted above hot rolled 16 oz., cold rolled 14 oz. and heavier, add 1c.; polished takes 1c per sq.ft. extra for 20-in. widths and under; over 20 in., 2c.

BRASS RODS—The following quotations are for large lots, mill, 100 lb. and over, warehouse; 25% to be added to mill prices for extras; 50% to be added to warehouse price for extras:

	Current	One Year Ago
Mill	$32.25	$42.00
New York	34.25	45.50
Cleveland	25.00	38.00
Chicago	29.50	42.50

ZINC SHEETS—The following prices in cents per pound prevail:

Carload lots f.o.b. mill 15.00

	In Casks		Broken Lots	
	Current	One Year Ago	Current	One Year Ago
Cleveland	18.75	21.00	18.40	21.50
New York	16.50	23.00	17.00	23.25
Chicago	22.00	22.50	21.50	23.50

ANTIMONY—Chinese and Japanese brands in cents per pound, in ton lots, for spot delivery, duty paid:

	Current	One Year Ago
New York	14.50–15	16.00
Chicago	13.50	18.50
Cleveland	16.00	19.00

SHOP MATERIALS AND SUPPLIES

OLD METALS—The following are the dealers' purchasing prices in cents per pound:

	New York		Cleveland		
	Current 1918	One Yr. Ago	Current 1918	One Yr. Ago	Chicago
Copper, heavy and crucible	23.50	26.50	24.00	24.75	22.75
Copper, heavy and wire	22.50	25.50	23.00	24.75	22.00
Copper, light and bottoms	20.50	23.50		22.00	20.75
Lead, heavy	7.00	9.00	21.50	1.50	7.50
Lead, tea	5.25	7.00	7.5	7.00	6.50
Brass, heavy	14.75	16.50	6.00	17.00	23.00
Brass, light	11.00	13.00	12.50	12.50	12.00
No 1 yellow brass turnings	13.00	17.50	14.00	15.00	6.25
Zinc	5.75	6.25	6.50	6 50	6.25

ALUMINUM—The following prices are from warehouse at places named:

	New York	Cleveland	Chicago
No. 1 aluminum, guaranteed over 99% pure, in ingots for remelting (ton lots) per lb.	32.10c.	32.20c.	33½c.

This is the Government price for lots of from 1 to 14 tons.

COPPER BARS from warehouse sell as follows in cents per pound, for ton lots and over:

	Current	One Year Ago
New York	42.00	41.00
Chicago	38.00	41.00
Cleveland	36.50	41.00

BABBIT METAL—Warehouse price per pound:

	New York		Cleveland		Chicago	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
Best grade	125.00	70.00	108 00	70.00	100.00	70.00
Commercial	70.00	40.00	23.00	24.50	24.00	25.00

SHOP SUPPLIES

NUTS—From warehouse at the places named, on fair-sized orders, the following amount is deducted from list:

	New York		Cleveland		Chicago	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
Hot pressed square	$2.50*	List	$1.40	$1.65	$1.05	$3.00
Hot pressed hexagon	2.50*	List	1.20	1.50	.85	3.00
Cold punched square	2.50*	List	.75	1.40	1.00	1.60
Cold punched hexagon	2.50*	List	.75	1.40	1.00	2.00

* List plus.

Semifinished nuts sell at the following discounts from list price:

	Current	One Year Ago
New York	40%	50%
Chicago	50%	50%
Cleveland	60%	50%

MACHINE BOLTS—Warehouse discounts in the following cities:

	New York	Cleveland	Chicago
⅝ by 4 in. and smaller	30%	46%	37%
Larger and longer up to 1 in. by 30 in.	15%	40%	25—5%

WASHERS—From warehouses at the places named the following amount is deducted from list price:

For wrought-iron washers:
New York ..... $2.50 Cleveland ..... $3.00 Chicago $2.50

For cast-iron washers the base price per 100 lb. is as follows:
New York ..... $5.00 Cleveland ..... $4.00 Chicago $3.50

CARRIAGE BOLTS—From warehouses at the places named the following discounts from list are in effect:

	New York	Cleveland	Chicago
⅝ by 4 in. and smaller	30%	46%	37%
Larger and longer up to 1 in. by 30 in.	15%	40%	25—5%

COPPER RIVETS AND BURS sell at the following rate from warehouse:

	Rivets		Burs	
	Current	One Year Ago	Current	One Year Ago
Cleveland	List plus 10%	List plus 10%	List plus 10%	List plus 10%
Chicago	List price	List price	List plus 20%	List price
New York	20% from list	10-2½% from list	List plus 20%	10-2½% from list

RIVETS—The following quotations are allowed for fair-sized orders from warehouse:

	New York	Cleveland	Chicago
Steel ⅞ and smaller	30%	45—5%	45%*
Tinned	30%	45—5%	45%*

Button heads, ¾, ⅞, 1 in diameter by 2 in. to 5 in. sell as follows per 100 lb.
New York..$6.14½ Cleveland..$5.15 Chicago..$5.67 Pittsburgh..$4.65

Coneheads, same sizes:
New York..$6.24½ Cleveland..$5.25 Chicago..$5.77 Pittsburgh..$4.75

MISCELLANEOUS

SEAMLESS DRAWN TUBING—The base price in cents per pound from warehouse in 100-lb. lots is as follows:

	New York	Cleveland	Chicago
Copper	49.00	42.50	39.50
Brass	40.00	40.00	44.00

For immediate stock shipment 3c. is usually added. The prices of course vary with the quantity purchased. For lots of less than 100 lb. but not less than 75 lb., the advance is 1c.; for lots of less than 75 lb. but not less than 50 lb., the advance is 2½c. over base (100-lb. lots); for less than 50 lb. but not less than 25 lb., 5c. should be added to the base price: and for quantities under 25 lb. the increase above base is 10c.

TIN PLATES—Warehouse prices per box:

Coke tin plate, 14 x 20:

	Cleveland		Chicago	
	Current	One Yr. Ago	Current	One Yr. Ago
100 lb	$10.00	$12.00	$10.60	$11.75
I. C. 107 lb.	10.15	12.17½	10.70	11.90

Terne plate, 20 x 28:

Base Weight	Net Weight	Coating				
100 lb.	200	3	18.95	18.70	19.10	17.00
I. C.	214	8	19.25	19.00	19.40	17.35
I. C.	270	8	21.75	21.50	21.40	19.45
I. C.	218	12	21.75	19.85	22.60	18.35
I. C.	221	15	22.50	20.35	22.10	18.60
I. C.	226	30	23.25	21.75	22.60	19.65
I. C.	231	25	24.50	23.50	23.10	20.40
I. C.	236	30	25.75	23.50	23.60	21.35
I. C.	241	35	26.75	24.50	25.10	23.35
I. C.	246	40	28.00	25.75	25.60	23.65

NOTE—New York prices furnished on application to dealers. Price varies according to whether the plates are wanted for work essential to the war or for nonessential work.

COTTON WASTE—The following prices are in cents per pound:

	New York		Cleveland	Chicago
	Current	One Year Ago		
White	11.00 to 13.00	13.00	16.50	12.00 to 16.50
Colored mixed	8.50 to 12.00	10.00	13.00	11.50 to 14.00

WIPING CLOTHS—Jobbers' price per 1000 is as follows:

	13¼ x 13¼	13¼ x 20½
Cleveland	52.00	68.00
Chicago	48.00	50.00

SAL SODA sells as follows per 100 lb.:

	Current	One Month Ago	One Year Ago
New York	$1.75	$1.75	$1.75
Philadelphia	1.75	1.75	1.75
Cleveland	2.40	2.35	2.00
Chicago	4.65	2.00	2.00

ROLL SULPHUR in 360-lb. bbl sells as follows per 100 lb.:

	Current	One Month Ago	One Year Ago
New York	$4.30	$4.30	$2.85
Cleveland	4.60	4.50	4.50
Chicago	4.00	4.65	3.00

COKE—The following are prices per net ton at ovens, Connellsville, and cover the past four weeks:

	July 17	July 10	July 3	June 27
Prompt furnace	$5.00	$5.00	$5.00	$6.00
Prompt foundry	7.00	7.00	7.00	7.00

FIRE CLAY—The following prices prevail:

	Current
Chicago, 450-lb. bbl.	$2.50
Cleveland, 375-lb. bag	2.50

LINSEED OIL—These prices are per gallon:

	New York		Cleveland		Chicago	
	Current	One Year Ago	Current	One Year Ago	Current	One Yr. Ago
Raw in barrels	$1.82	$1.16	$2.00	$1.20	$1.74	$1.21
5-gal. cans	19.3	1.26	2.15	1.35	1.94	1.36

WHITE AND RED LEAD in 500-lb. lots sell as follows in cents per pound:

	Red				White			
	Current		1 Year Ago		Current		1 Year Ago	
					Dry	and	Dry	and
25 and 50-lb. kegs	12.38	12.83	13.50	13.50	12.38		13.25	
12½-lb. keg	12.60	13.05	13.75	14.00	12.60		13.50	
1-lb. cans	14.85	.....	.....	.....	14.85		.....	
100-lb. keg	12.15	12.60	13.25	13.50	12.15		13.00	
5-lb. cans	13.95	.....	15.25	15.50	13.95		15.50	

NEW *and* ENLARGED SHOPS

Consult the Buying Section when in need of machinery or supplies

WASHINGTON, D. C.

The Navy aims to give information regarding its purchases to all manufacturers known to be in a position to supply its demand. Owing to the need of prompt action in the cases of all machine tools hereinafter listed, the Navy cannot arrange to permit a postponement of the opening of bids if the manufacturers are able to secure bidding forms and submit their bids prior to date fixed for opening.

In case time does not permit this, it will be appreciated if any manufacturer not receiving information directly regarding these purchases will notify the Purchasing Division, Bureau of Supplies & Accounts, Navy Department, Washington, D. C., in order that the firm's name may be properly listed for all future purchases.

Bids will soon be received by the Bureau of Supplies and Accounts, Navy Department, for furnishing machines and machine tools as follows:

Locomotive, Schedule No. 5022½, delivery Indian Head, Md.

Machine tools, Schedules Nos. 5034½, 5079½, 5080½, 5090½, 5095½.

Constructing and repairing drills, gauges, etc., Schedule No. 1892.

Machine tools, Schedules Nos., 1893, 1894, 1899, 5094½, delivery Wash., D. C.

Hydrogen cylinder valves, Schedule No. 5054½.

Machine tools, Schedule No. 5065½, delivery Great Lakes, Ill.

Shells, Schedule No. 5067½, delivery Torpedo Station, Newport, R. I.

Machine tools, Schedule No. 5078½, delivery Boston, Mass.

Machine tools, Schedule No. 5081½, delivery Pensacola, Fla.

Constructing and repairing machine tools, Schedule No. 5082½.

Machine tools, Schedule 5096½.

Machine Tools—Schedules Nos. 5109½, 5110½, 5111½, 5113½, delivery Wash., D. C.

Machine Tools—Schedule No. 5112½, delivery Coco Sola.

Machine Tools—Schedule No. 5114½, delivery Norfolk Hospital, Norfolk, Va.

Machine Tools—Schedule No. 5115½, delivery Puget Sound.

Machine Tools—Schedule No. 5116½.

Bids will be received by the Bureau of Supplies and Accounts, Navy Department, for furnishing machines and machine tools as follows:

August 2—Woodworking machine, Schedule No. 5138½. Machines, Schedule 5139½. Woodtrimmers, 5140½. Electric band saws, 5142½. Drill pressers, 5144½. Patternmakers' lathes, 5145½. Electric drills, 5146½, delivery Mare Island, Calif. Grinders, 5149½, delivery Mare Island, Calif. Foundry equipment, 5159½, delivery Philadelphia, Penn. Machine tools, 4936½, delivery Philadelphia, Penn. Lathes, 4849½, delivery Annapolis, Md.

August 20—Boring machine, Schedule 4937½, delivery Wash., D. C.

Bids will be received by the Bureau of Supplies and Accounts, Navy Department, for furnishing machines and machine tools as follows:

July 29—Grinding machines, Schedule No. 5038½, delivery Wash., D. C. Pressure pump, Schedule No. 5041½, delivery Boston, Mass. Torpedo air compressors, Schedule No. 5044½, constructing and repairing. Boxboard matching machine, Schedule No. 5048½, delivery Norfolk, Va. Electric supplies, Schedule No. 5055½, delivery Great Lakes, Ill. Servo motors, Schedule No. 5089½. Motors, Schedule No. 5091½, delivery Brooklyn, N. Y., and Philadelphia, Penn.

August 2—Threading milling machine, Schedule No. 5012½, delivery Wash., D. C. Foundry machine, Schedule No. 5086½, delivery Wash., D. C.

August 20—**Machine tools, Schedule No. 1901, delivery Wash., D. C.**

Bids were received by the Bureau of Supplies and Accounts, Navy Department, for furnishing machines and machine tools as follows:

(Item 1)—One "V" glue, universal jointer, Class 482, Schedule No. 4860½, delivery Wash., D. C., from J. A. Fay & Egan Co., John and Front St., Cincinnati, Ohio, $1381, $1915, $2093. P. B. Yates Machine Co., Beloit, Wis., $1375; American Woodworking Machine Co., 591 Lyell Ave., Rochester, N. Y., $610.

(Item 1)—One bolt-heading machine, for heading bolts from ¾ to 1 in., weight about 225 lbs. with steel dies, Class 513, Schedule No. 4839½, delivery U. S. Naval Ammunition Depot, Iona Island, N. Y., from Ajax Manufacturing Co., 3830 Lakeside Ave., Cleveland, Ohio, $3929; W. Davis Machine Tool Co., 945 Pennsylvania Ave., Wash., D. C., $2440; Fairbanks Co., Colorado Bldg., Wash., D. C., $124, part bid; Kemp Machine Co., 223 North Calvert St., Baltimore, Md., $27, part bid; Manning, Maxwell & Moore, 119 West 40th St., New York City, $229, part bid; D. Nast Machine Tool Co., Bourse St., Philadelphia, Penn., $120, part bid.

(Item 1)—One hundred and fifteen machinists' swivel jaw and swivel base type vises, Class 516, Schedule No. 4880½, delivery Navy Yard, Philadelphia, Penn., from Columbian Hardware Co., 1290 East 53d St., Cleveland, Ohio, $18.40; Dale-Brewster Machine Co., 30 Church St., New York City, $19.40; Fairbanks Co., 701 Arch St., Philadelphia, Penn., $19.30; C. Parker Co., 48 Elm St., Meriden, Conn., $18.40; R. Surpless Dunn & Co., 74 Mulberry St., New York City, $18.40, alternate bid $27.50; Rock Island Manufacturing Co., 1st St. and 14th Ave., Rock Island, Ill., $18.03; Barnett Foundry and Machine Co., Irving-on-Hudson, N. Y., alternate bid, $15.

(Item 1)—One single opening, steam platen, 30 x 30 in. press, Class 517, Schedule No. 4826½, delivery Mare Island, Vallejo P. O., Calif., from Farrell Foundry Machine Co., 30 Main St., Ansonia, Conn., $1,077; Hydraulic Press Manufacturing Co., Mt. Gilead, Ohio, $2454, $2754; R. D. Wood & Co., 400 Chestnut St., Philadelphia, Penn., $1530; Watson-Stillman, 50 Church St., New York City, $2650.

(Item 1)—Six universal, portable, electric tool grinders, Class 519, Schedule No. 4882½, delivery Navy Yard, Wash., D. C., from W. Davis Machine Tool Co., 945 Penn. Ave., Wash., D. C., $58.50; Dale Brewster Machine Co., 30 Church St., New York City, $80; Hisey-Wolf Machine Tool Co., Colerain and Marshall St., Cincinnati, Ohio, $72; Kemp Machine Co., 223 North Calvert St., Baltimore, Md., $65, $62; Manning, Maxwell & Moore, 119 West 40th St., New York City, $56; D. Nast Machine Tool Co., Bourse St., Philadelphia, Penn., $75; Sherritt & Stoer Co., Finance Bldg., Philadelphia, Penn., $69; United States Electrical Tool Co., 2488 West 6th St., Cincinnati, Ohio, $60; Young, Corley & Dolan, Inc., 115 Bway., New York City, $65.

(Item 1)—One hundred and thirty-two portable, engine lubricating, oil tanks, Class 540, Schedule No. 4895½, from S. F. Bowser & Co., Inc., 29 Hayden St., Fort Wayne, Ind., $88, $93, $100; Chicago Steel Tank Co., 733 South Halsted St., Chicago, $133; Gilbert & Barker Manufacturing Co., Cold Springs Ave., Springfield, Mass., $88; Milwaukee Tank Works, 851 Kinnickinnic St., Milwaukee, Wis., $72.19; Wayne Tank and Pump Co., Canal St., Fort Wayne, Ind., $83.25.

(Item 1)—One 6-in., **motor-driven, vertical** shaper, exclusive of spares, Class 541, Schedule No. 4846½, delivery Navy Yard, Philadelphia, Penn., from Newton Machine Tool Works, 23d and Vine St., $2032, $2147; Pratt & Whitney Co., 436 Capitol Ave., Hartford, Conn., $1950; W. E. Shipley Machine Tool Co., Morris Bldg., Philadelphia, Penn., $1815.

Hoists, Class 547, Schedule No. 4897½, delivery Mare Island, Calif., from Chisholm Moore Manufacturing Co., 5046 Lakeside Ave., N. E., Cleveland, Ohio, $6648, alternate, $3144.

(Item 1)—One motor-driven, pipe cutting and threading machine, Class 552, Schedule No. 4844½, delivery Charleston, S. C., from Kemp Machine Co., 223 North Calvert St., Baltimore, Md., $1085; Landis Machine Co., Waynesboro, Penn., $2505; Manning, Maxwell & Moore, 119 West 40th St., New York City, $1770; Niles, Bement & Pond, 111 Bway, New York City, $2825; D. Saunders & Sons, Inc., 21 Atherton St., Yonkers, N. Y., $2775; Jarecki Manufacturing Co., 149 East 9th St., Erie, Penn., $1222.

(Item 1)—1 double cylinder, cabinet, divided rolls and chip breaker planer, complete with motor to place 26 in. wide and 8 in. thick; Class 583, Schedule No. 4921½, delivery Naval Air Station, Rockaway, Rockaway Beach, L. I. from American Woodworking Machine Co., 591 Lyell St., Rochester, N. Y., $1,423; Buss Machine Works, Holland, Mich., $2,919, $2,872; J. A. Fay & Egan Co., John and Front Sts., Cincinnati, Ohio, $2,288, $3,416, $3,675, $3,672; Kemp Machine Co., 223 North Calvert St., Baltimore, Md., $2,954; Manning, Maxwell & Moore, 119 West 40th St., New York City, $3,095; Machine Tool Engine Co., 149 Bway, New York City, $3,003; B. D. Whitney & Son, Winchendon, Mass., $3,135; P. B. Yates, Beloit, Wis., $2,742, $2,767.

(Item 1)—**6#** capacity, chain, worm geared, ½-ton hoists; (Item 2)—60 capacity, chain, worm geared, 1-ton hoists; Class 588, Schedule No. 4816½, delivery Navy Yard, Boston, Mass., from Chisholm Moore Manufacturing Co., 30 Church St., New York City, $3,630; Dale Brewster Machine Co., 30 Church St., New York City, $3,840; A. D. Granger & Co., 15 Park Row, New York City, $4,107; Wright Manufacturing Co., 9 East 40th St., New York City, $4,920.

(Item 1)—8 portable, motor driven, bench planers; Class 598; (Item 2)—Sixteen, 15 in. disc., portable, motor driven sanders, Class 599; (Item 3)—4 complete, portable, motor driven, oscillating spindle sanders with 220 volt D. C. motors, Class 600, Schedule No. 4931½, delivery, Boston, Mass., from Fairbanks Co., Colorado Bldg., Wash., D. C., (1) $107; Kemp Machine Co., 223 North Calvert St., Baltimore, Md., $110; Manning, Maxwell & Moore, 119 East 40th St., New York City, (1) $109; Monarch Machine Co., 300 North 3rd St., Philadelphia, Penn., (1) $89; D. Nast Machine Co., Bourse St., Philadelphia, Penn., (1) $108; Swind Machine Co., Widener Bldg., Philadelphia, Penn., (1) $110; L. Sturgis, 223 North Calvert St., Baltimore, Md., (1) $105; J. D. Wallace, 1401 West Jackson Blvd., Chicago, Ill., $94; Kemp Machine Co., 223 North Calvert St., Baltimore, Md., (2) $256; Manning, Maxwell & Moore, 119 West 40th St., New York City, (2) $205; Machine Tool Engine Co., 149 Bway, New York City, (2) $197; Swind Machine Tool Co., Widener Bldg., Philadelphia, Penn., (2) $239; (3) $176; Machine Tool Engine Co., 149 Bway, New York City, (3) $176.

(Item 1)—1 extension gap, back geared, screw cutting, 18 in. by 36 in. by 8 ft. centers closed by 12 ft. centers extended, motor driven lathe; (item 1a)—1 complete set of motor and controller spare parts, Class 602 Schedule No. 4933½, from Kemp Machine Co., 223 North Calvert St.